

By the same Author

1. Evolution of Food Policy in India
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Industrial Relations
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Green Revolution in India

The Relevance of Administrative Support for its Success
(A Study of Punjab, Haryana, U.P. & Bihar)

R.N. CHOPRA

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*Respectfully Dedicated to the
Cherished Memory of
Late S. Partap Singh Kairon Ex. Chief Minister
Whose Contribution to the
Prosperity of Punjab
was Unrivalled and whose Inspiration & Encouragement
to the Fieldworkers was closely experienced
by the Author*

QUOTES

"There lies no desert in the land of Life ;
For e'en that tract that barrenest doth seem,
Laboured of thee in faith and hope, shall teem
With heavenly harvests and rich gatherings rife."

From the Bible quoted on Page XV in
Introduction in "Picturesque Kashmir"
by Arthur Neve FRCS, LRCP (Edin),
Jaykay Book House, Jammu Tawi (1984).

"And, he gave it for his opinion ; that whoever could make two ears of
corn or two blades of grass to grow upon a spot of ground where only
one grew before ; would deserve better of mankind and do more essential
service to his country than the whole race of politicians put together"

"A Voyage to Brobdingnag"
in Swift's Gulliver's Travels.

"A proper combination of political will, professionalism and people's
action is essential to harness the power that science gives us for increasing
human happiness and welfare"

—Dr. M.S. Swaminathan
in "Agricultural Progress—Key to Third
World Prosperity"—III World Lecture, 1983.

"That good government is no substitute for self government is axiomatic.
But the converse is also true ; self government is no substitute for good
government."

B.K. Nehru, Governor of Gujarat (1985)

“To get out of this torpor (of immobilisme), the mere urge is not enough. The tools of action must be sharpened and the muscles of the will to act steadfastly must be developed. Concretely, the administrative machine, using the term in its widest sense, has not only to be kept in good trim, but adapted to suit changing needs. Those who have to use the machine must have the strength, the will and the knowledge to do so. Taken separately these are difficult enough, but a sort of vicious circle develops when combining the two.”

S. Boothalingam's Chapter on "Some Aspects of Civil Service" in "Memoirs of Old Mandarins of India," Documentation Centre for Corporate & Business Policy Research, New Delhi, 1985.

“If our non performance is to be obliterated, the gap between thought and action will have to be bridged immediately.

The lethargy is rooted in centuries of neglect by local ruler and conqueror. Non performance has become a way of life. Naturally there is no magic management which can change this changeless state of affairs. A selective step by step approach, from one specific reform to another, taking into account a variety of debilitating causes, would be the most intelligent way of sparking a return to accountabilities. Of course, it assumes that those who govern us are bound by acknowledged disciplines—for an uncaring, immoral ruler will only nurture an uncaring, immoral society.”

Romesh Thapar's Article "No Work ETHIC" in The Illustrated Weekly of India August 11, 1985.

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LIST OF ABBREVIATIONS

AV	Average
AP	Andhra Pradesh
APC	Agricultural Prices Commission
ARDC	Agricultural Refinance & Development Corporation
BDPO	Block Development & Panchayat Officer
CADA	Command Area Development Agency
CCB	Central Cooperative Bank
CM	Chief Minister
CD/NES	Community Development & National Extension Service
CADP/A	Command Area Development Programme/Agencies
DDA	Deputy Director of Agriculture
DDO	District Development Officer
DA/DAO	Director of Agriculture/District Agricultural Officer
DPAP	Drought Prone Area Programme
EADA	Extra Assistant Director of Agriculture
ESA	Economic & Statistical Advisor
FCI	Food Corporation of India
FSS	Farmer's Service Society
GR	Green Revolution
GMF	Grow More Food Campaign
HYVP/hyvp	High Yielding Variety Programme
HA/ha	Hectare
HAFED	Haryana Cooperative Marketing Federation
IADP	Intensive Agricultural Development Programme
IRD(P)	Integrated Rural Development (Programme)
IAAP	Intensive Agricultural Area Programme
IARI	Indian Agricultural Research Institute
IKAR	Indian Council of Agricultural Research
IPP	Integrated Production Programme
IRRI	International Rice Research Institute, Manila
ICSSR	Indian Council of Social Sciences Research
Kwh	Kilowatt hour (unit)
K.G/kg	Kilogram
LDB	Land Development Bank
M.I./mi	Minor Irrigation

M.P.	Madhya Pradesh
M & M	Major & Medium
m	million
M.T./m.t.	Million Tonnes
mt	Metric Tonne
MHA/mha	Million Hectare
MFAL	Marginal Farmers & Agricultural Labourers
NABARD	National Bank for Agriculture & Rural Development
NCAER	National Council of Applied Economic Research
NCA	National Commission on Agriculture
NREP	National Rural Employment Programme
NPK	Nitrogen, Phosphorus and Potash
NSC	National Seeds Corporation
OFD	On Farm Development
PAC	Public Account Committee
PLDB	Primary Land Development Bank
PA/pa	Per annum
PR	Panchayati Raj
PAU	Punjab Agricultural University
Q	Quintals
RBI	Reserve Bank of India
RLEGP	Rural Landless Employment Guarantee Programme
SMS	Subject Matter Specialist
SFDA	Small Farmers Development Agency
Sqkm	Square kilometer
T & V	Training & Visit
UP	Uttar Pradesh
UT	Union Territory
TN	Tamil Nadu
VLW	Village Level Worker
WB	West Bengal
%	Percentage

FOREWARD

In the very first page of Volume one of the Seventh Plan, attention is drawn to the uneven spread of modern agricultural technology in the Country in the following words :

"There is a serious regional imbalance in the impact of the green revolution in that less than 15 per cent of the area under foodgrains accounts for 50 per cent of the increase in foodgrains production in the postgreen revolution period. Greater efforts are required for improving rice yields, particularly in the eastern regions, and for enhancing the productivity of rainfed and dryland agriculture".

Rice production in the Punjab increased from less than 3 lakh tonnes in 1965-66 to over 50 lakh tonnes in 1984-85. The growth rate in a *kharif* crop like rice was 16 per cent per annum, in contrast to a 5 per cent increase in wheat, a major *rabi* cereal. This is opposite of the general trend in the rest of the country. What are the factors responsible for such impressive changes within a span of 20 years ?

Shri R.N. Chopra has painstakingly brought together vast amount of data relating to the factors responsible for the progress of north-west India in elevating and stabilising the yields of wheat, rice and other crops. His insights are particularly penetrating because of the vast personal experience with programmes which led to the birth and growth of the green revolution in the Punjab. His stress on the relevance of administrative support to the success of the Green Revolution is very timely.

Agricultural transformation requires for its success an economically viable and socially acceptable technological package together with appropriate packages of services and public policies. Soon after our Independence in 1947, our late Prime Minister Jawahar Lal Nehru convened a meeting of agricultural experts at the Indian Agricultural Research Institute, New Delhi to work out a strategy for achieving food self-sufficiency in five years. I happened to attend that meeting as a Post-Graduate Scholar of IARI. I still vividly recall that every expert was confident that the country could become self-sufficient speedily, provided the findings from his own discipline were transferred to the field. For example, the pest control expert felt that by proper pest management, a minimum of 10 per cent more food can be produced. Those working on rate control felt that by applying their knowledge, 20 per cent more food can be saved ; plant breeders felt that by cultivating new varieties, at least 10 per cent more grains can be produced. In fact, when all such possibilities were counted, it appeared that food production can be doubled very easily. However, we know that

until the advent of the high yielding varieties in the mid 60s, production advances came largely from area expansion. Once varieties which can respond to good water and nutrient management became available, farmers introduced a complete set of improved management practices. Thus, the area of wheat revolution also became the area of rice revolution and potato revolution. This is because farmers do not live in compartments. They adopt a system approach and are encouraged to invest their scarce resources only when they are assured of a fair return for their labour.

In retrospect, I am happy that an analysis on the above lines which led to my proposing to the then Director of IARI, Dr. B.P. Pal in 1962 that we should launch a dynamic programme of breeding dwarf varieties of wheat using the Norin-10 dwarfing gene material developed by Dr. N.E. Borlaug in Mexico proved to be correct. The decision to go in for a dwarf wheat breeding and popularisation programme and to invite Dr. Borlaug to India in 1963 was entirely ours and was not the result of any suggestion from outside experts.

We owe a deep debt of gratitude to Shri R.N. Chopra for his labour of love for Indian agriculture. I am confident that the book will be widely read and appreciated.

30th Jan. 1986

Dr. M.S. SWAMINATHAN
Director General,
International Rice Research Institute
and President,
International Union for the
Conservation of Nature and
Natural Resources (IUCN).

Introduction

Just on Independence India's foodgrains production was 51 m.t. and population 361 millions. In the 1983-84 crop, India produced over 150 m.t. of foodgrains, feeding a population of 700 million people, building up a surplus also. This performance was out done in 1984-85. It was a very creditable performance indeed, production stabilising around 150 m.t., production outstripping the population increase year after year.

One does not know for certain how far the family planning efforts will succeed in controlling the growth in population, nor is it possible to say at this stage to what extent the general economy of the country will improve over the years, to create more demand for food by better standards of living. One thing however is certain : that more and more food will be needed in the future for mere survival, if not for the standards. The overall situation is hopeful in the sense that the demographic revolution and the advent of the Green Revolution in the last couple of decades have been, theoretically at least, complementary to each other—the latter supplying the tool to counteract the grave threat from the former. It is very vital, all the same, that our efforts at growing more and more foodgrains should be intensified and if more cultivable area is not available, more food should be produced by multiple cropping as well as by using modern technology to augment per hectare productivity. Experience is plenty available ; in the last about two decades, the three north western states of Punjab, Haryana and UP (western) have gone through the green revolution in wheat and rice and, similarly, the two southern states of Andhra and T.N. in rice alone, to a considerable extent. It is now imperative that apart from these very states making further strides in this direction, some of the central and eastern states, like MP, UP (eastern), Bihar, Orissa and WB, also join the fever and the fray of the green revolution by adding to their food production and productivity, following in the footsteps of their predecessors in other states—improving their own style of

working, gaining from others' conditions, problems and experience and emulating latter's clear, political and administrative skills to achieve results on the ground.

Let us look at the food situation from another angle. After struggling hard for years to become self-sufficient in foodgrain supplies we have now reached a level of production which is adequate for subsistence, even surplus, but only in the economic sense. The current accumulation of a huge buffer stock is there with the public agencies, partly because a big chunk of our population below the poverty line cannot afford to buy grain adequate for their nutritional needs. A lot of these people live in UP and Bihar and other states and are really small and marginal farmers, not able to make a viable living for themselves. This close link between food supply, poverty and agricultural productivity has to be disturbed by teaching enabling, and persuading these people to produce much more than at present from the available resources. The paddy growing states of eastern India have the lowest agricultural productivity and, in result, have the highest incidence of rural poverty. Public policy must ensure that "the share these small/marginal farmers have in land ownership and agricultural operations, and consequently in the growth of production, is raised substantially, partly through land redistribution and mainly through concentration of all possible public and private effort to improve their production and productivity by application of improved technology, extension services, adequate credit, input supplies and correlated "infrastructure".¹

The object of this book is to narrate, explain and emphasise the experience of Punjab and Haryana in the sphere of agricultural production and productivity and apply to the extent possible, these lessons to UP and Bihar. This tiny state of Punjab, with 2.5% to the country's population, produces more than 15% of its wheat and rice and contributes half of the supply of foodgrains required to meet the needs of the country's public distribution system. It has been enhancing its agricultural production right from Independence through an optimum utilisation of available resources of land, water, inputs, institutional changes, including land reforms and consolidation of holdings, augmentation of irrigation facilities, electrification of rural areas and road construction linking villages with main roads etc. The lead in this direction was provided by the nonmuslim peasantry migrating from the canal colonies of western Punjab (now Pakistan), full of a spirit of innovation, initiative and hardwork. Not that these positive things started happening all at once in the new state of East Punjab nor that the overall objective of reaching the peak of agricultural production had shimmered on their economic horizon so very clearly; the fact was that having been virtually ruined by the event of partition, and consequential enmasse migration, these people were deeply inspired and resolutely determined to get on with the job and restore the status quo of prosperity of the canal colony days in the new state. Under the able direction, guidance and stewardship of late Partap Singh Kairon, first as Development Minister (1948-56) and later as Chief Minister (1956-65), they worked hard as if all concerned were of the same mind, same determination and the same unbending will; the results on the ground were inevitably awaiting to be picked up, much to their own joy and that of the country.

It is admitted by all that Punjab owes much of its prosperity to the unusual stability, purposefulness and single mindedness imparted to its government by Partap

Singh Kairon ; the institutions set up by him continued to function well even during the period following his sudden elimination from the scene in 1965. Between the political leadership at the top and the industrious peasantry below, there were the silent, resolute and relentless administrators, technocrats and other members of the bureaucracy providing the link between the file and the field, between decisions and their implementation, between political will clearly expressed and its efficient implantation on the ground—all working as a team so well, so hard, so much in cohesion and coordination that the results were inevitable. The present writer was deeply involved in this game of 'sharp' economic development, mainly agricultural, in various capacities in the state, as Collector (3 districts), as Development Commissioner Hill Areas (1961-65), as additional Chief Secretary and then as the first Development Commissioner of the new state of Haryana (1966-67). This involvement with food production had grown over the years since 1951 as earlier he had been Director General Food in Punjab from 1951-53, delivering the much needed food surpluses, however small then, to the rest of the country. And, as if to round off all the field experience over the preceding more than twenty years, he was entrusted with the challenging task of heading one of the biggest public sector undertakings in the country—the Food Corporation of India (1973-77). His abiding interest in the distribution of food in a continent-sized deficit country required the experience not only in production—including the travails and trials involved in the modernisation of agriculture in a tradition-bound society—but also the marketing and procurement of food-grains, with all the countrywide implications and ramifications of a complicated task. Having been involved in both, he had ample opportunity to watch how policy and implementation developed at various stages and how progress was made in the Punjab in the field of agricultural production ; how, though unwittingly, adequate ground had already been prepared for receiving the Green Revolution when it came with open arms, with all its speed, intensity and fruitfulness. It would be interesting, as well as instructive, to go into the details of operations in Punjab leading to various stages of improved and modernised cultivation and its aftermath, for the period upto 1964-65 as distinct from the post 1965-66 period, viz., the pre and post green revolution era in the state. In particular it would be useful to indicate what role the administrative machinery of the state played in giving a practical shape to the new ideas and new technology behind that revolution viz., Hyv seeds, fertiliser use, irrigation augmentation including installation of tubewells/pump-sets, rural electrification, communication linkages and the marketing effort—all in a manner so well coordinated and orchestrated that the results made their appearance far beyond expectations. It is well to reiterate here that in a developing backward economy, it is the government which has to take the initiative and supply the necessary 'know-how' and the inputs to the people, even to popularise them through demonstration and extension methods.

The objective behind such a narrative would be to learn a few lessons for the states in India like Eastern UP and Bihar which are comparatively lagging behind in the matter of food production or have not succeeded in adopting the new technology in agriculture to the same extent as Punjab and Haryana. No two situations can be similar, nor can the experience of one state fit into the requirements of the other

exactly since the inevitabilities of time and space, inclinations and environments, including social preferences of one, may be entirely or considerably different from those of the other but the point would need to be made that there is a lot to learn from each other's experience as much in the case of individual human beings as in the case of the constituent states of the Indian Union, with a view to giving a fillip to the total developmental effort in the desired direction. In concrete terms, the ultimate objective of the state government's endeavours in the field of enhanced food production would be like the following :

"Since the dwarf wheat and miracle rice and other high yielding varieties of crops have opened up revolutionary possibilities, these should be cultivated with meticulous care according to prescribed practices, with the needed inputs backed by a broad spectrum of services and facilities."²

The present study by an administrator turned author, therefore, proceeds with the description of the progress made by the country as a whole in food-grains production since Independence, the introduction of the green revolution in the mid sixties, the salient but also essential components of that revolution, the steps taken and the results obtained by the four states (why only four ?) of Punjab, Haryana, UP and Bihar in foodgrains production before and after the advent of that revolution, the reasons and factors leading to the success or otherwise of these states in that direction. Some broad but pertinent inferences have been drawn for successes and failures : some suggestions have been made for improvements also.

A word for the choice of these states ; Punjab was chosen not only because it was the state in which I had worked for so many years but also that it had led in performance in agriculture throughout : Haryana because not only I was its first development commissioner but that it had shown how the lag in agricultural development could be made up in a period much shorter than in Punjab ; UP because its western region had made very good progress in this direction—why not the eastern also ? and Bihar because its economy in general and food production in particular had remained stagnant, inspite of the many similar broad advantages it had which were not exploited—and why not ?

As it is, the task was big enough to tackle. I had the initial disadvantage of not being technically an economist, but the plus point of being a practical administrator, with a historical bent of mind, encouraged me to embark on it with confidence and faith because I did want to share some of my own experiences and other's, at various levels, in this field of agricultural development. I had seen the work in the field at the Collector's level, in the state headquarters as development commissioner and still higher from the vantage point as Principal Secretary to the Chief Minister Punjab (1960-61). I failed to understand, particularly when I incidentally studied the working of the UP and Bihar states in the realm of foodgrains production and procurement (as Chairman FCI), why these two neighbouring states could not perform as well as Punjab and Haryana had done :

they all belonged to the same Indo-Gangetic plain, blessed with so much water and so much rich soil etc.

I mentioned about my project to Dr. M.S. Swaminathan at the IRRI Manila, Philippines early in the year 1984 across the table. He encouraged me and followed it up with a letter on 27 Feb. 1984, of which the following is an extract :

"I do hope you will write your book on the various steps which went into the making of the Green Revolution in the Punjab. Often people tend to feel that such changes are caused by only one factor such as "miracle seeds." Your detailed description of what all went into the making of the Green Revolution in the Punjab will help to show that only by hard and systematic work over a period of time that real progress can be achieved."

Dr. Swaminathan realised the limitations of a geneticist scientist. The limitations of an agricultural economist are well known. I have known the limitations and difficulties of an administrator in the field, concerned with agricultural production. Still worse are the complications and confusions of an 'un-professional' writer who ventures to describe fruitfully his own, and other people's experiences of the Green Revolution in the Punjab and Haryana, with a view to extending the lessons learnt to the problems of UP and Bihar so that the goal of foodgrains production and productivity is attained. Here is the result of my efforts in the pages that follow.

Many friends have helped me with the materials and books on the Green Revolution in India. Some have given very useful suggestions. I am grateful to them all. My knowledge of the happenings in the Punjab and Haryana has been more intimate and detailed. That about the UP and Bihar is what I could gather from the printed books and documents. I have done no particular (original) research in any of the aspects concerning my subject. What conclusions have been drawn or suggestions made, arise from the study of the facts already available on record. The culling of facts, their presentation in juxtaposition and coordination, the description and arrangement of conclusions, as well as suggestions, are all mine ; for data and statistics—sometimes even useful ideas—I have relied on many learned authors and their books ; I have indicated the sources where necessary.

The main purpose of this book is to "provoke" the political decision maker, the ordinary politicians and administrators of UP and Bihar, into studying the progress made by Punjab and Haryana in agricultural production—what precise stages and how they in Punjab went through them in making the Green Revolution a roaring success—and consider applying their experience, tactics and gadgetary, intelligently and circumspectly to the situation in their own states. More than one full generation gap between the two groups of states has occurred in the matter of agricultural productivity. If the problems are properly understood now, and priorities defined and provided for, there is no reason why UP and Bihar should not catch up with Punjab and Haryana in the course of less than two or three Plan periods from now. There is nothing which is not available in these states by way

of resources which cannot be exploited to the optimum, provided political will and administrative action are there in abundant measure. That perhaps is the crux of the matter.

It will be an act of sheer ingratitude if I do not particularly mention here about the sizeable moral and intellectual support—in the shape of discussions, suggestions, a run through the first draft etc.—which my friend and erstwhile colleague in service, Mr. S. Vohra, gave to me from time to time in the preparation of this book. I am indeed grateful to him.

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Jan, 1986.

NOTES

- 1 M L. Dantwala's Article on "Agricultural Prices, Production and Surplus stock" for a Seminar held in New Delhi on 23-25 Ap. 1985 (unpublished)
- 2 Sudhir Sen, 'Reaping the Green Revolution', Tata Mcgrawhill Publishing Co. New Delhi, 1975, P xi.

PART ONE

**Agricultural Production and Introduction
of Green Revolution in India**

Trend of Agricultural Production in India —Some Facts and Glimpses

Extent of Arable Land

Total geographical area of India is 328 mha. The extent of arable land (viz., net sown area plus current and other fallow lands) is only 160.6 mha. In the first few years of planning after independence the net sown area in the country increased mainly on account of largescale land reclamation and then it stabilised. Starting with 119 mha it reached 129 mha during the First Five Year Plan and 139 mha by 1971-72. By 1981-82, it had reached 142 mha.

Progress of Net Irrigated Area

The gross irrigated area in the country went on increasing—from 19.4 mha during the quinquennium ending 1949-50, to reach 63 mha by 1983, as under :

by 1950-51	20.9 mha	}	increases due to canals and well irrigation viz., major, medium and minor irrigation projects.
1960-61	24.7 mha		
1970-71	31.6 mha		
1979-80	56.5 mha		
1983	63.3 mha		

The spread of irrigation in various parts of the country, however, was uneven. Among the major states, Andhra Pradesh, UP, Haryana, Punjab and Tamil Nadu have been doing well. See some figures below :

TABLE 1
Net area Cultivated and Irrigated—Statewise
In 1967-68 and 1978-79

(In' 000 hectares and %)

	State	1967-68			% Irrigated to Total Area (1978-79)	Productivity of Food- grains KG/HA (1981-82)
		Net Area Cultivated	Net Area Irrigated	4 as % of 3		
1	2	3	4	5	6	7
1.	Andhra	11367	3089	27.2	35.8	1238
2.	Bihar	8284	2011	24.3	32.6	872
3.	Gujarat	9802	1108	11.3	18.6	1162
4.	Haryana	3514	1132	32.2	53.9	1391
5.	Kerala	2129	411	19.3	12.3	1508
6.	M.P.	17797	1143	6.4	11.1	719
7.	Maharashtra	18267	1476	8.1	11.6	744
8.	Karnataka	9987	1082	10.8	15.4	984
9.	Orissa	5939	977	—	19.2	911
10.	Punjab	3992	2333	58.4	83.0	2667
11.	Rajasthan	15097	1865	12.4	19.7	550
12.	T.N.	6083	2629	43.2	49.7	1520
13.	U.P.	17465	5657	32.4	43.5	1191
14.	W. Bengal	5569	1478	26.5	19.6	1071
15.	India	139702	27523	19.7	27.5	1033

Source : (i) Report of Irrigation Commission 1972-Vol 1, Page 82.
(ii) Indian Agriculture in Brief 19th Edition, 1982, pp. 230-31, 256-257.

Table 2 below gives details of the (statewise) position of irrigated (net) areas under principal crops and its percentage to total area thereof.

Depending on the availability of plan funds, the above mentioned states have gone ahead with irrigation, for with irrigation is directly connected the success of the new technology in agriculture, including higher productivity per hectare. The miracle of the high yielding variety seeds—as a part of the green revolution—does not also work without irrigation. Even Bihar and U.P. have done slightly better in increasing their area under irrigation, and hence yields per hectare, compared with that of M.P. and Maharashtra.

TABLE 2
Showing Statewise (i) Area Irrigated by Principal Crops incl. total area under foodgrains
Crops (ii) Percentage of Irrigated area to total area under foodgrain (1978-79)

State	Area Irrigated under			% of Irrigated to Total Area			Total Area under crop					
	Rice	Wheat	Total foodgrains	Total area	Rice	Wheat	Total foodgrains	Total area	Rice	Wheat	Total foodgrains	Total cropped
1	2	3	4	5	6	7	8	9	10	11	12	13
Andhra Pradesh	3751	15	4027	4698	94.3	65.2	41.7	35.8	3979	23	9648	13121
Assam	532	—	538	572	33.8	—	32.6	17.3	2241	68	2445	3311
Bihar	1941	1298	3472	3707	34.8	71.9	34.0	32.6	5579	1805	10209	11381
Gujarat	180	378	693	1936	39.2	61.0	15.1	18.6	459	620	4590	10389
Haryana	426	1320	2188	2979	93.0	89.1	51.2	53.9	458	1481	4273	5522
Himachal Pradesh	53	55	137	156	55.8	16.8	16.1	16.7	95	334	853	935
J & K	241	54	331	—	89.9	26.1	38.9	40.9	268	207	850	990
Karnataka	688	83	1172	1718	62.7	21.3	15.6	15.4	1093	389	7494	11133
Kerala	255	—	255	354	31.9	—	30.4	12.3	799	—	840	2886
M.P.	821	980	2005	2413	17.0	25.9	11.2	11.1	4821	3788	17836	21858
Maharashtra	396	484	1357	2306	26.4	40.8	9.6	11.6	1498	1187	14090	19860
Orissa	1161	38	1293	1586	28.6	61.3	19.4	19.7	4372	62	6690	8275

1	2	3	4	5	6	7	8	9	10	11	12	13
Punjab	1014	2512	3986	5506	96.4	91.7	83.8	83.0	1052	2738	4738	6630
Rajasthan	80	1544	2369	3451	37.0	77.5	19.0	19.7	211	1991	12433	17496
T.N.	2586	—	2893	3819	92.7	—	56.1	49.7	2756	2	5156	7684
U.P.	1118	5928	8381	10570	21.7	80.2	41.8	43.5	5147	7390	20072	24300
West Bengal	1353	32	1433	1541	28.7	40.5	29.5	19.6	4765	521	5957	7878
All India	16847	14770	36865	48090	41.6	65.2	28.5	27.5	40487	22657	129353	175177

Source : Indian Agriculture in Brief 1982, pp. 226-238.

Spread of Irrigation cropwise

Total cropwise, 80 per cent of the gross irrigated area was under foodgrains, among which the area under wheat increased three fold between 1950-51 and 1971-72, whereas under rice it rose hardly by 50% in the same period. By 1978-79, it was net 65.2 per cent for wheat and 41.6 per cent for rice, though only 28.5 per cent for all foodgrains. These percentages of cropwise irrigated area in relation to total irrigated area from 1960-61 to 1978-79 is given below :

TABLE 3
Area Irrigated—Cropwise, and Percentage to total Irrigated Area
(In mha)

Crop	1978-79		1977-78		1970-71		1960-61	
	Area	%	Area	%	Area	%	Area	%
Rice	16.8	35.0	16.2	35.2	14.3	37.5	12.5	44.7
Wheat	14.8	30.7	13.7	29.8	9.9	26.0	4.2	15.1
Sugarcane	2.5	5.2	2.6	5.7	1.9	4.9	1.7	6.0
Oilseed	1.7	3.4	1.6	3.4	1.1	2.9	0.4	1.5
Cotton	2.0	4.2	2.1	4.6	1.4	3.6	1.0	3.4
Others	10.3	21.5	9.8	21.3	9.5	25.1	5.2	29.3
Total Gross Irrigated area	48.1	100.0	46.0	100.0	38.2	100.0	28.0	100.0

Source : Statistical outline of India 1984 Tata Service Ltd. Deptt of Economics and Statistics.

Efforts to Increase Production under the Plans

Starting with a production base of a little over 50 m.t. of foodgrains in 1951, India reached a level of about 150 m.t. in 1983-84 and more in 1984-85. It was a remarkable achievement, thanks to the valiant efforts of its farmers, helped with the planning and financial assistance from the Government of India in conditions of freedom and the urge to become self-reliant. Increasingly larger allocations were made for agriculture under the five year plans: private investment was also increasing with enhanced profitability from cultivation, depending on prices and per hectare productivity under improved methods of farming, including the green revolution ethos. For assessing the progress and performance of agriculture, the period can be divided in three spans viz., 1950-51 to 1964-65, 1965-66 to 1972-73 and 1974-75 to 1982-83. In the first span of 14 years, production increased more or less on traditional lines, with emphasis on irrigation and traditional inputs like improved seeds and fertilisers. During the next two spans, a new strategy of agricultural production, based on scientific advances in farm technology under the label of Green Revolution was adopted—to achieve almost a breakthrough in production and productivity in some areas. The highest rate of growth in agriculture was 4.1 per cent

TABLE 4

Area, Production and Yield of Crop—All India (1950-51, 1960-61, 1970-71, 1980-81 to 1983-84)

Area, Production and Yield of Crop—All India (1950-51, 1960-61, 1970-71, 1980-81, 1981-82, 1982-83, 1983-84)														
A : Area in lakh hectares		P : Production in lakh tonnes/bales								Y : Yield in kgs. per hectare				
Crop		1950-51	1960-61	1970-71	1980-81	1981-82	1982-83	1983-84						
	1	2	3	4	5	6	7	8						
Rice	A	308.10	341.28	375.92	401.52	407.08	382.62	409.90						
	P	205.76	345.74	422.25	536.31	532.48	471.16	597.68						
	Y	668	1013	1123	1336	1308	1231	1458						
Wheat	A	97.46	129.27	182.41	222.79	221.44	235.67	243.95						
	P	64.62	109.97	238.32	363.13	374.52	427.94	451.48						
	Y	663	851	1307	1630	1691	1816	1851						
Jowar	A	155.71	184.12	173.74	158.09	165.99	163.76	162.63						
	P	54.95	98.14	81.05	104.31	120.62	107.53	119.34						
	Y	353	533	466	660	727	657	734						
Bajra	A	90.23	114.69	129.13	116.57	117.84	109.42	118.10						
	P	25.95	32.83	80.29	53.43	55.37	51.31	76.24						
	Y	288	286	622	458	470	469	646						
Maize	A	31.59	44.07	58.52	60.05	59.35	57.20	58.88						
	P	17.29	40.80	74.86	69.57	68.97	65.49	79.24						
	Y	547	926	1279	1159	1162	1145	1346						

1		2	3	4	5	6	7	8
Total Cereals	A	782.30	920.18	1017.82	1042.10	1052.95	1022.62	1069.36
	P	424.14	693.14	966.04	1189.62	1217.88	1176.62	1388.88
	Y	542	753	949	1142	1157	1151	1299
Gram	A	75.70	92.76	78.39	65.84	78.68	73.99	73.08
	P	36.51	62.50	51.99	43.28	46.42	52.90	47.55
	Y	482	674	663	657	590	715	651
Total Pulses	A	190.91	235.63	225.34	224.57	238.43	228.33	234.12
	P	84.11	127.04	118.18	106.27	115.07	118.57	126.55
	Y	441	539	524	473	483	519	541
Total Foodgrains	A	973.21	1155.81	1243.16	1266.67	1291.38	1250.95	1303.48
	P	508.25	820.18	1084.22	1295.89	1332.95	1295.19	1515.43
	Y	522	710	872	1023	1032	1035	1163

Source :— Annual Report of the Ministry of Agriculture, Government of India, 1984-85, p. 175.

TABLE 5

Total Area under Foodgrains, Net Irrigated area, Total foodgrains Production, Area and Production of Rice and Wheat—Punjab, Haryana, UP and Bihar compared
(Years 1967-68 to 1981-82 ; Production '000 Tonnes ; Area '000 ha)

State	1978-79 Total area under food-grains	Net Irrigation area under 1978-79			1978-79 % Irrigated area to total area under food-grains	Total foodgrain production			Rice		Wheat					
		Rice	Wheat	All food-grains		1967-68	1970-71	1981-81	Area	Production	Area	Production				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Punjab	4,754	1014	2512	3986	83.8	5407	7306	13326	263	1270	297	3755	1540	2919	2040	8553
Haryana	4,273	426	1320	2188	51.2	3992	4751	6040	167	506	212	1250	699	1562	881	3682
UP	20,072	1118	5928	8381	41.8	16779	19585	24220	4359	5307	3245	5726	3974	7849	3348	12883
Bihar	10,209	1941	1298	3742	31.0	8627	7881	8591	5276	5459	4568	4261	678	1744	455	2569
All India	1,29,353	16947	14770	36885	28.50	95052	108442	129586	—	40705	—	53590	—	22306	—	37883

Source :— (i) Report of Irrigation Commission 1972, Vol. I, P. 43.

(ii) Report of National Commission on Agriculture, Vol. I, 1274, P. 360-66.

(iii) Indian Agriculture in Brief 19th Ed., 1982, pp. 225-6 and 231.

p.a. in the first plan, 3 per cent p.a. each in the second and third plans and 2.2 per cent p.a. in the fourth, and still higher in the subsequent plan periods.

From 1950-51 to 1973-74 the compound rate of growth averaged 2.46 per cent p.a. During 1949-50 to 1964-65 the annual growth rate in production was 2.98 per cent in foodgrains and 3.6 per cent in nonfoodgrains.

Table 4 on pages 14 to 15 shows area, production and yield of crops All India, comparing 1950-51, 1960-61, 1970-71 with the last four years upto 1983-84. Total foodgrains production had increased from 51 m.t. in 1950-51 to 133 m.t. in 1981-82 and to 151.5 m.t. in 1983-84, average all India yield having doubled from 522 kg per ha in 1950-51 to 1032 kg in 1981-82 and 1163.19 kg in 83-84. More remarkably, the production of wheat had increased from 6.5 m.t. in 1950-51 to 37.5 m.t. 1981-82 and to 45.1 m.t. in 1983-84 viz., more than seven times increase, with per ha yield having gone up from 663 kg in 1950-51 to 1630 kg in 1980-81 and 1851 kg in 1982-83. In rice, the production had increased from 20.6 m.t. in 1950-51 to 54 m.t. in 1980-81 and to 59.8 m.t. in 1983-84, with per ha yield having gone up from 668 KG in 1950-51 to 1336 kg in 1980-81 and 1458 kg in 1983-84. Productivity in terms of indices, if the triennium ending 1960-61=100 be the base index, dropped down to 94 in 1966-67 (the year of the very severe drought) but it increased to 124.8 in 1970-71. A constant increase in wheat crop was recorded however from 130.7 in 1968-69 to 164.7 in 1971-72. In the case of rice there was only a modest increase.

Table 5 on page 16 gives a statewise picture of land utilisation, net irrigation, including percentage of irrigated to total cultivated area under foodgrains, area as well as production of wheat and rice, comparing the progress of the years 1962-65 (average) with 1971-74 (average) and 1981-82.

The above figures reveal the following for the the period 1962-65 Av. and 1981-82 :

(i) In regard to *rice*, Punjab, Haryana, UP and Bihar have shown per cent production increases of 1164, 490, 76.5 and—6.73 respectively, and in respect of wheat, the per cent increases are 379, 318, 285 and 464 respectively.

In the same period percentages of area increases in case of rice have been 383, 203, 21.8 any 3 and for wheat 89, 123, 98, and 157 respectively. Let us juxtapose the information in Table 6 on the next page.

In rice production, Punjab and Haryana have done remarkably well ; whereas UP has been so so, Bihar has deteriorated. In wheat production, Punjab and UP have done relatively better though even Bihar's progress is praise worthy. This is only relative progress ; see (ii) below and the last column in the table on page 18.

(ii) Comparing the performance of these states between 1967-68 and 1981-82 in respect of total foodgrains, the best scorers are Punjab and Haryana—followed by UP. Least impressive is Bihar having lost on even what it was actually producing in 1967-68. See columns 7, 8 and 9 in Table 5 above.

(iii) Whereas it would be interesting to go into the reasons for the remarkable success of Punjab and Haryana in the matter of foodgrains production, as well as the reasons inhibiting similar attainments in UP and Bihar, it would be useful to project in what ways could the Punjab and Haryana lessons or experience be applied to the other two northern states.

TABLE 6
Percentage increase in area and Production of rice and wheat between
1962-65 (Av) and 1982-83

State	Rice		Wheat		Productivity Rise		% increase in total food-grains production 1967-68/1981-82
	Area	Production	Area	Production	Rice	Wheat	
Punjab	383	1164	89	319	162	121	+ 144.7
Haryana	203	490	123	318	185	87	+ 51
UP	21.8	76.5	98	285	45	95	+ 44
Bihar	3	— 6.73	157	464	— 38	120	— 1

(iv) The procurement of foodgrains in Punjab and Haryana was most outstanding, followed by that of UP. It would be a matter of interesting analysis to ascertain what contributed to such a phenomenal jump in the productivity of these two states and the resulting surpluses of foodgrains therein.

India's Future Food Needs

Today (1985) with a population of over 70 crores, and comparatively low standard of living of majority of our people, we may be satisfied with a food production level of 150 m.t. per annum—though even that level is of a rather fluctuating nature depending on the weather, flood and drought conditions and these four or five-yearly fluctuations usually, disturb our national food security balance. We must, however, assess the real dimensions of the present challenge faced by Indian agriculture (80 per cent of which consists of production of foodgrains) in the context of the next few decades. As it is, agriculture absorbs 75 per cent of our labour force. This may go down to 60 or 65 per cent with industrialisation and urbanisation in the coming one score years or more. But India's population itself may also touch one billion by 2000 AD and be around 13 or 1400 millions in the two decades thereafter. Let us not forget that the time lag between reduction in our death rate and reduction in birth rate is still noticeably present and the demographic transition is still to take place. The resultant rising population would be pressing against the available food supplies produced, by and large, by traditional even obsolescent cultivation methods in a major part of the country.

Even at the present levels of consumption¹ Indian agriculture will be required to accomplish the task of doubling its foodgrains production within the next 25-30 years, merely to survive on the physical plane. In other words, the production level will have to rise to 300 m.t. per annum compared with only 150 m.t. at present. If higher levels of consumption are to be provided for and some exportable surplus

catered, we would need to reach a production level of 400 to 450 m.t. in the next 40 years. Quite an uphill task, if not all that impossible looking. Hope lies in the central and eastern plains of the country in the shape of higher productivity.

Apart from reaching the outer limit of per hectare productivity growth in states at present doing well, the real growth in the next decades will have to be concentrated in areas where agricultural productivity has so far stagnated, as for example, in the eastern and central states of the country. The growth has so far been sustained by the north western and some southern states only. The next quantum jump would be possible only when the eastern and central states of eastern UP, Bihar, West Bengal, Orissa and Madhya Pradesh raise their productivity through a determined, well planned effort. They have very large unexploited soil and water resources and they can make big strides in grain production with the by now available and well tested technology. As an example, West Bengal's experiments with wheat production in the mid 70s were very successful and a high level of productivity had actually been attained. "Eastern UP is catching up fast; the productivity in eastern districts has picked up and met the deficit of the state, even declared a surplus of 2 m.t. wheat in 1983 for the central pool!"² Can the results be repeated in Bihar, MP, Orissa and Assam with suitable adjustments in policy and methodologies?

The task of bringing one state to the level of the other in agricultural productivity even when the resources are more or less equal is not all that easy. The comparatively well-known problems of input supplies, irrigation, fertilisers and crop protection can, perhaps, be dealt with smoothly but the problems that need to be tackled besides are much more complex and difficult viz., problems of smaller localised tracts and individual villages or individual holdings in villages. There are also problems like consolidation of holdings that cannot be solved unless the whole village, tract or the State is mobilised collectively. With such a mosaic of ostensibly unsolvable problems challenging us the question is : are we prepared to accept the challenge?

Let us put another vital aspect of this problem in the words of P.V. Narasimha Rao, then our Defence Minister, who had stated as under in his address to the Hissar Agricultural University on 11 May 1984 :—

"In particular low agricultural productivity in a state is not necessarily a result of low land fertility, want of water or any such inherent causes. It lies often times in a complex web of extraneous conditions—social, economic and attitudinal. It is here that agriculture comes to have ramifications far beyond the known bounds and any attempt to tackle this problem would have to be of a composite interdisciplinary character, well coordinated between the central and state governments as well as several other institutions at different levels."³

Gilbert Etienne, who has done a good study of Indian agriculture, holds that any all India production figure, any general judgement in agriculture is misleading because of the diversity of growth conditions, crop yields and frequently the farmer's behaviour. He cites the example of the eastern plains where the soils are fertile, the rains relatively heavy and the potential of irrigation enormous. Despite

this we have poor nurseries, unlevelled fields, lack of weeding and excess water preventing the use of fertilisers and hyv rice— "and yet India's ability to feed its population lies in future in the eastern plains where between 20—27 mha can be irrigated, compared with the total irrigated area in the country of about 60 mha. With water management, including drainage and flood control, enormous progress can be achieved. A Bihar farmer harvesting 700-1000 kg per hectare wheat and some pulses can, in the first stage, reach 2000 kg of rice, followed by a similar amount of wheat. In West Bengal and Orissa, the farmer can harvest 4000 kg of rice in two crops and a third crop of quick maturing pulses could be introduced between rabi and kharif—while nature is ready to help, the main constraints are man-made. First, several land-owning castes are not agriculture-oriented by tradition. They are 'dhile hain'—they are relaxed and not pushing. Then unlike the already advanced districts of UP, these areas are starting late when population densities are already high. Also water management problems are much more formidable in the eastern plains than say in Punjab. In the eastern plains it will not be enough to have more private tubewells. Also needed would be major irrigation works, massive drainage projects and flood control measures—all costly and complex."⁴

This is a heartening picture in a way. Mr. B. Venkateswarlu of the IRRI Philippines has the following view in the matter of comparative advantages of states :—

"Punjab stands for non-problem and high-yield environment in agriculture. It is blessed with all the desirables viz.,

- (i) favourable climatic composition, that is, moderately high radiation, less cloudiness, low and low to medium relative humidity. It is anti-pest and anti-disease, facilitating high input management ;
- (ii) application of 126 kg NPK per hectare is very high and helpful; compared with the 35 kg national average ;
- (iii) Irrigation facilities are highly improved, including exploitation of the ground-water for cultivation of rice and wheat;
- (iv) high amount of credit is made available ;
- (v) its land reforms are production-oriented. Rice cash crop system grew impressively in a revolutionary manner due to its modern and non-traditional nature of farming ;
- (vi) It has no big problem of water submersion and drought.

Thus the Punjab syndrome of farming system is a low risk and high production one."

The situation in north eastern states is quite opposite which could be said as the syndrome of low-production and high-risk environment—; It has (enumeration added) :—

- (i) problems of excess and inadequate water condition for rice ;
- (ii) low input management ;
- (iii) low fertiliser consumption, (10-20 kg/ha)

- (iv) limited non problem irrigation ;
- (v) monsoon season is characterised by high winds, low light, high humidity and waterlogged conditions favourable for high pest complex and low productivity ;
- (vi) modernisation faces resistance—traditionalism being still prevalent :
- (vii) non-availability of finance/credit presenting a major hurdle to high level management."

It was particularly noted by Venkateswarlu that nontraditional wheat was spreading fast in West Bengal mainly because of availability of water conditions and better input management : "since it is a new system, the problems of traditionalism are limited."

"The southern India" has prepared adequately and is in a 'take off' stage but all the time the fight was against unfavourable climatic composition such as untimely rains, water submersion, high pest load and low fertiliser application (30 to 60 kg/ha). Nondevelopment of adequate irrigation, partial exploitation of ground-water potential and lack of adequate water facilities are major factors for a prolonged lull but the symptoms of advancement are steadily emerging. MP and UP have large problem areas (drought and water stagnation), their input applications are low, they have poor water delivery and drainage systems, poor credit facilities and very poor transport systems."⁵

This shows that transformation from traditional to modern agriculture under the Green Revolution concept is associated mainly with inputs, irrigation and credit facilities plus favorable climatic conditions. Where such facilities are lacking, productivity would be low. Low risk and high yield environments remain to be unexploited due to inadequacy of inputs rather than modern technology. This is no doubt an oversimplification of the problem ; the question is how do we manage that all these facilities are made available to all concerned with farming, especially the poor ones, adequately and at the right time ? Is it then only an administrative matter? We will explore this question in later chapters.

In Table 7 below, area, production and productivity of foodgrains as a whole have been compared statewise for the period of two decades 1961-1980. Disparities among states particularly in regard to yields (in kg/ha) are so glaring—even where similar common factors of production were many—that it is not difficult to conclude that the administration/extension services in the laggard states did not come upto the mark and thus failed in their duty to avail of the golden opportunity presented by the new 'miracle seeds', without the democratic processes or the federating centre having been able to take them to task or apply the correctives in time.

There is ample data to show (not added) that between 1960 and 1980 :

- (i) Land production ratio was less than 1.000 in MP, UP, Orissa and Bihar ;
- (ii) This ratio was more than one in Maharashtra, Gujarat, TN, AP, West Bengal, Karnataka and Punjab ; (Ratio=land in mha/production in m.t.)
- (iii) Total rice area in India increased from 28 mha in 1950 to 40 mha in 1977 ; total production also increased from 21 to 55 m.t. in 1981 ;

TABLE 7
Area & Production of Foodgrains in different states during last 2 Decades 1961-80
(Area in million ha; Production in million Tonnes, yield in kg/ha)

Area in million ha; Production in million Tonnes, yield in kg/ha)

State	Area Total		Difference during the period	Average annual Area		Production Total		Difference during the period	Average annual production		Area		Yield	Area		Yield	Production		Yield
	1961-70	1971-80		1961-70	1971-80	1961-70	1971-80		1961-70	1971-80	1961-70	1971-80		1961-70	1971-80		1961-70	1971-80	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
1 AP	92.40	91.00	-1.4	9.2	9.1	70.80	86.80	16.0	7.0	8.6	8.76	9.99	1143	9.14	11.38	1238			
2 Assam	21.10	23.52	2.4	2.1	2.3	19.50	22.70	3.2	1.9	2.2	2.52	2.70	1072	2.50	2.43	969			
3 Bihar	96.80	99.17	2.3	9.6	9.9	74.30	90.30	16.4	7.4	9.0	10.02	9.91	989	9.85	8.59	872			
4 Gujarat	86.0	42.05	-44.0	8.6	4.2	27.90	37.70	9.8	2.7	3.7	4.47	4.47	1001	4.74	5.09	1162			
5 HP	6.19	7.50	1.3	0.6	0.7	6.50	9.60	3.1	0.6	0.9	0.87	1.18	1359	0.85	1.06	1240			
6 Haryana	17.60*	39.90*	—	1.7*	3.9*	16.10*	47.60*	—	1.6*	4.7*	3.98	6.04	1519	4.34	6.04	1394			
7 J & K	7.70	15.61	7.9	0.7	1.5	7.60	10.70	3.1	0.7	1.0	0.83	1.3	1563	0.83	1.27	1529			
8 Karnataka	54.0	68.01	14.0	5.4	6.8	46.00	63.70	17.7	4.6	6.3	6.62	5.88	888	6.7	6.59	984			
9 Kerala	11.90	8.90	-3.0	1.1	0.8	11.60	13.80	2.2	1.1	1.3	0.84	1.27	1541	0.83	1.28	1538			
10 MP	158.20	130.42	-28.0	15.8	13.0	90.80	86.20	-4.6	9.0	8.6	17.80	12.41	697	17.69	12.72	719			
11 Maharashtra	129.30	134.50	5.0	12.9	13.4	63.70	82.40	18.7	6.3	8.2	14.1	9.76	695	14.2	10.58	744			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
12 Orissa	53.90	62.80	8.9	5.3	6.2	54.30	47.80	-6.5	5.4	4.7	6.9	5.98	865	6.9	6.25	911
13 Punjab	49.80	43.50	-6.3	4.9	4.3	58.20	86.01	27.8	5.8	8.6	4.84	11.90	2458	5.0	13.26	2667
14 Rajasthan	90.70	132.27	41.5	9.0	13.2	52.20	64.50	12.3	5.2	6.4	12.34	6.5	526	12.29	7.15	550
15 TN	50.70	50.10	-0.6	5.0	5.0	58.30	80.70	22.4	5.8	8.0	4.11	5.49	1335	4.76	7.23	1520
16 UP	187.60	201.14	14.0	18.7	20.1	148.90	172.20	23.1	14.8	17.2	20.47	24.95	1219	20.33	24.22	1191
17 WB	62.30	63.10	0.8	6.8	6.3	60.5	77.3	16.8	6.0	7.7	6.1	8.28	1356	6.0	6.47	1071

Source :—B—Venkateswarlu—"Dynamics of Green Revolution of India". Agricole Publishing Academy 1985, p. 26-27

- (iv) The area under wheat increased from 10 to 22.5 mha and production from 7.0 to 36 m.t. in 1950 to 1980. In productivity Punjab recorded 2.75 to 3 tonne/ha, comparable to that in Italy, U.S.A. and the USSR.

Source :- B. Venkateswarlu, "Dynamics of Green Revolution in India." Agricole Publishing Academy, New Delhi, 1985 ; p. 54.

NOTES

1. The per capita local availability of foodgrains in India was 131, 160, and 156 kg respectively in the years 1951, 1965, and 1976. The highest ever reached was 171 kg in 1972. If developed countries are any guide in the matter of per capita consumption of grain, we are lagging far behind.
2. *Times of India*, New Delhi, 16 Oct. 1984.
3. *Main Stream* New Delhi, 19 May 1984.
4. Gilbert Etienne "Greener Pastures", *India Today*—New Delhi, 30 April 1984.
5. Venkateswarlu "Dynamics of Green Revolution" Agricole Publishing Academy, New Delhi, 1985, pp 278-79.

Introduction of Green Revolution in India

(I) BIOLOGICAL BREAK-THROUGH

General

The gap in the food needs of developing countries was made up most in the years 1965-75. Most important factor responsible for this advance was the development by agricultural scientists, of the short stiff-strawed, fertiliser responsive varieties of wheat and rice which essentially double the yield potential of mankind's two most important food crops.

The Paddock Brothers had predicted doom—a famine for hungry nations on the food front by 1975, in their book "Famine 1975—America's Decision—who will survive?" in 1967 and yet a "turn around" took place in the late sixties in the shape of dwarf varieties of seed—a turn around which has few parallels in human history.

Dr Norman Borlaug was incharge of the Wheat Development Programme in Mexico in the fifties. A down-to-earth visionary he, in fact, was the genetical architect of the dwarf wheat. Earlier he and Dr Harrar had conducted in the late forties a most relentless breeding programme choosing the best of the wheat genes in the world. They worked round the clock, growing two generations of breeding material each year, saving time by half. By 1951, the efforts at breeding a suitable dwarf wheat variety were crowned with success in Mexico. Insisting on a package deal for the field, Borlaug saw to it that the farm acceptance was rapid also. In fact, a seed-fertiliser revolution had taken place. Mexico was self-sufficient in food by 1956. But Borlaug's dream wheat had not yet been evolved. He continued his gene-hunting relentlessly and experiments continued. Mere treatment of rust was not enough. To meet the lodging problem, the wheat plant "had to be stiffened and shortened

so that it could stand erect with long heads containing plenty of kernels and holding them tighter until they ripen for harvesting."

The Japanese wheat variety NORIN-10 was crossed with the Mexican improved varieties and the first break-through came in 1961 when the resulting Pitic 62 and Penjamo 62 were released in Mexico and in result Mexican farmers were able to obtain yields as high as 7000 KG per hectare-2½ times of the previous varieties. These were non-lodging-varieties, heavy on fertilisers and irrigation but possessing heavier tillering and grain-filling qualities. In four years these varieties occupied 95 percent of the wheat area in Mexico.

These experiments in Mexico led to the greatest practical contribution to world agriculture through the field of genetics and plant breeding, plant protection, soil science and general farm management etc.² One was reminded of the following para in Swift's Gullivers Travels :—

"And, he gave it for his opinion : that whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before ; would deserve better of mankind and do more essential service to his country than the whole race of politicians put together."

[A voyage to Brobdingnag]

Dr. Borlaug was honoured with the award of Nobel Prize in 1974.

For centuries the typical rice plant of the tropics was tall with long drooping leaves. It survived under conditions of inadequate insect, weed and water control and non-use of fertilisers but its yield was low, though dependable. When fertiliser was applied to these traditional varieties to augment the yield, the plant became taller, leafier and lodged before harvest. The situation which the tropical farmer faced was : if he did not apply fertiliser, yield would be low for lack of nutrition and if he used it he received no increase in grain because of lodging and wastage. Earlier the response of traditional wheat plants to fertilisers was essentially the same ; the same improvements to rice varieties were needed if yields were to improve beyond 1965 levels.

The Green Revolution in rice was triggered off by the intense upsurge in rice research resulting from the establishment of the IRRI at Manila. Some work on rice had been done in Taiwan. Infact it was from Asia, the house of rice plant, that the germ plasma came which opened up new horizons of the rice crop. The IRRI was started by the Rockefeller and Ford Foundations originally. Now it is receiving funds from a Consortium of over 30 foreign aid agencies called CGIAR—The Consultative Group on International Agricultural Research—which supports other research countries also around the world.

The story of the 'miracle seed'—dwarf rice—did not start till 1962 ; the path had been charted by wheat in which Borlaug and Co. had to spend many years evolving the ideal wheat plant. The procedure for rice also would be the same. Rice yield in temperate climate was 5000 kg per hectare, for example in Japan, whereas in the tropics it was only 1500. Why could not the latter catch up with the former ?

In the beginning the mere application of fertiliser had led to decrease in yields by more lodging and less photo synthesis because of shade and less grain formation, including damage by pest attacks. The new plant, therefore, had to be short, sturdy, erect-leaved, nonlodging, disease-resistant and fertiliser-responsive, with a high grain building capacity. Many hundreds of rice strains were screened and experimented upon by the IRRI to locate the suitable genes for use in the breeding programme.

Success came in 1965 with IR-8-288-3 giving an outstanding performance in the field. This was the miracle rice, with a yield potential of 9000 kg per hectare—six times that of Indica rice varieties. IR8 is a

“Short upright, heavy tillering, a great consumer of fertilisers, giving undreamt of yields—a great contribution from IRRI to tropical agriculture.”³

It was obvious that a combination of Hyv of seeds and multiple cropping would raise the average hectare yield many times in tropical areas but in actual fact seven International Research Stations throughout the world and many national centres are experimenting with producing Hyv seeds to fit the numerous physical environments. And even then the ground has to be prepared indigenously to receive the new seeds and capture their potential by socio-economic engineering. According to Sudhir Sen

“In short, biological engineering must be accompanied by socio-economic engineering. It is the “wide cross” between these two different types of engineering that can produce a new hybrid type of economy which will be truly high yielding.”⁴

Socio-economic engineering in this context would include all what needs to be done at the scientist, government department and the farmers' level to derive the optimum results from the new seed varieties.

It was in the drought years of 1964-65 that the seeds of Green Revolution were first field tested in India. Dwarf wheat seed from Mexico was quickly acclimatised by Indian scientists and produced in time to be planted in the Indian soil at record speed. Dr Borlaug was responsible for introducing these seeds to the Indian scientists in the year (1963) for a direct transplant. He had predicted still earlier in 1961 that India could double her wheat production in one decade. India received seeds of four dwarf and semi-dwarf varieties—100 kg of each and some other selections. These seeds were planted in different soils in Delhi, Ludhiana, Pusa and Kanpur. Lerma Rojo and Sonora 64 yielded over 4000 kg per hectare—a four times increase over local varieties. Then a chain reaction followed, of experimentation, multiplication and evaluation etc., before the two varieties were released for general cultivation but after some national demonstrations were carried out by the scientists in about 100 different farmers' fields. To speed up cultivation, more seeds of Lerma Rojo—250 Tonnes—and Sonora 64 were imported from Mexico for distribution and multiplication at state seed farms and by farmers. In 1966 imports of seed went up to 16000 tonnes, enough for cultivating 4 lakh hectares of land. It was in 1967 that with intensive breeding local variants of dwarf wheat were released e.g. Kalyan

Sona, Sonalika, Sharbati Sonora and PV 18—to cater to Indian conditions and taste. These varieties were amber in colour and rust resistant.

Wheat production in the country went up by leaps and bounds. From only 11 m.t. of wheat in 1960-61 (base), it went upto 12.3 m.t. in 1964-65 and then on to 16.5, 18.7, 20.0 and 23.2 m.t. in the following four years ending with 1971. By then area under dwarf wheat was 6 million hectares. In less than a decade the wheat output had doubled (1961-71). In 1972, production was 26 m.t. In 1981-82 wheat production had increased to 37.8 m.t., to 43 m.t. in 1983-84 and to 46 m.t. in 1984-85. Dr Boriaug's predictions had come true many times over.

In India early attempts to increase rice productivity were made at the Indian agriculture experiment stations. In the fifties the International Hybridisation Scheme was set up by the International Rice Commission at the Cuttack Rice Research Institute to cross Japonica varieties with Indica varieties. The first high yielding variety of rice to be introduced in India in 1963 was Taichung-1 (Native)-or TN-1 released in Taiwan in 1952. Initial experiments were successful but the risk of disease had not been obviated beyond doubt. The Food Minister India decided to take some risk and imports were ordered. By 1965-66, TN-1 was sown in 6 lakh hectares of land. About this time IRRI had come up with IR-8 which, when introduced in the Indian soil in 1966, showed very good results. This would soon be elbowing out TN-1 and it did. Starting with a token of 12 hectare land under IR-8 in 1966, there were 2 million hectares of land under it by 1968. The new varieties spread with rapidity throughout the country. By 1978, 44% of the rice area in the country was covered by them. Some states covered even 60 per cent. Production of rice went up from 34.6 m.t. in 1960-61 to 42.2 m.t. in 1970-71, to 53.6 m.t. in 1980-81, about 57 m.t. in 1983-84 and 60 m.t. in 1984-85. All this helped to improve the country's food supply position.

The first Green Revolution had arrived, at least in some parts of the country, at a very quick pace. The Ministry of Agriculture called 1983-84 as the year of the Second Green Revolution in the country due to expansion in supplies of inputs and services to the farmers, the first being in 1967-68 due to introduction of Hyv seeds of wheat and rice.

Ostensibly, the Green Revolution had touched the states of Punjab, Haryana and western UP in regard to wheat production in a big way and these states plus Andhra Pradesh and Tamil Nadu for rice more or less similarly. The other states were lagging behind, for one reason or the other. As a country, organisationally, institutionally and mentally, all its constituent states should normally have the same approach and attitude towards the vital question of augmenting food production. Considering the local difficulties, initiatives and handicaps, overtime there should be no real obstacle in organising all that is required to plan for production, under new technology provided available resources are mustered to the maximum and a singleminded purposefulness is generated by local political leadership and the plan gets implemented on the ground by the administrative machine approaching the farmer whose interest can be rather easily aroused in the enterprise by appealing to his profit-making instinct particularly now that some states within the country have shown the productive and profitable way so clearly. There is no real reason why the rest of India

cannot follow suit, sooner than latter. No training facilities are needed from abroad. Every thing, including practical expertise, are available here and in abundance and no risk is involved. Sudhir Sen was quite right when he made the following observations in 1973 :—

“The Green Revolution is not a misnomer nor is it a fancy phrase ; it is already very much a reality. It has not solved the food problem of India and other developing countries but it has brought the solid assurance that the problem can be solved. It has given them a breathing space in a period of spiralling population, to come to grips with the problem and set their economic house in order.”⁵

By 1984-85 the food problem of India was [solved—hopefully finally—at least at the physical (availability) plane. The question of its economic availability still remained.

(ii) INTENSIVE AGRICULTURE DEVELOPMENT PROGRAMME (IADP) (The Adoption Breakthrough)

Before talking about the IADP which paved the way to an “Adoption Breakthrough” for the Green Revolution in India it will be useful to refer back to the FORD Foundation Study Report called “India’s Food Crisis and the Steps to meet it” (1959). One of the recommendations in the Report related to the package programme for augmenting agricultural production in the quickest time possible. The package concept took the shape of an IADP in actual practice.

The study made by this Team of 12 consultants in 1959 marks a watershed in the history of India’s agriculture. Sponsored by the Ford Foundation on the request of the Government of India, the Team was headed by Sherman E. Johnson and included experts in all specialities connected with agri production. After a three months study, the Team gave its report, realistic and practical, farsighted and timely and yet sympathetic and candid.

It talked of a crisis in foodgrains production of which the entire nation needed to be appraised and also of the steps required to meet it. Reckoning the growth in population, it saw that food would have to be provided for 80 million more people by end of the Third Plan—total 480 million by 1966. The Report suggested a production target of 110 m.t. by March 1966, even though the average annual production 5 years prior to the Report was only 70 m.t. Extra 40 mt were required to be produced in only 6 years. The Report suggested a comprehensive programme consisting of

- (i) use of chemical fertilisers, plus its production ;
- (ii) multiplication and distribution of improved seeds, including hybrid maize ;
- (iii) plant protection measures ; measures for soil and water conservation ; agricultural extension work ; livestock development ;] need to strengthen

agricultural administration giving it a more pronounced scientific orientation ; to reinforce research and experimentation ; to expand and improve the facilities for credit, supplies and marketing ;

(iv) To press ahead with land reforms to provide security of tenure to tenants.

Given the shortage of trained manpower and of essential supplies like fertilisers and pesticides, efforts must be heavily concentrated in areas with the greatest potential for producing the most important crops, rice and wheat and tailor-made production programmes must be worked out and introduced in each of these areas.

The Report was a decisive turning point. Its recommendations were accepted in June 1960 when a new strategy was adopted in the shape of a programme of intensive agriculture in selected districts, supported by modern inputs and improved practices.

It was a historic decision which yielded solid results. The relevance of the IADP experiment (1961-64) arises from the fact that it provided a crucial and much needed "adoption breakthrough"—adoption of modern techniques of agricultural growth which, when coupled with the epochmaking "biological breakthrough", described already, gave birth to the Green Revolution in India.

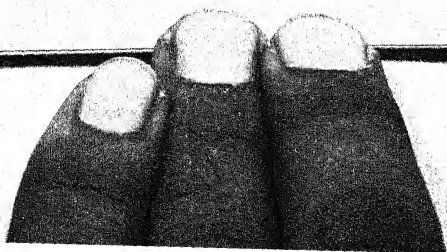
The most important step recommended by the Ford Foundation Team in the above mentioned Report was, as mentioned, about the concentration of effort and resources in a few selected areas possessing the highest potential to make the quickest impact in terms of increased agricultural output. The Team suggested that improvement of water management facility and cultural practices on lands now irrigated should go with it. It said that

"immediate steps should be taken in these areas to provide adequate systems of water conveyance and distribution to the farmers with necessary technical and financial assistance and with special attention to land levelling and land preparation to ensure more uniform distribution of water."⁶

Water is an important input in agricultural production but by itself it is not enough. It has to be combined with other inputs—improved seeds, fertilisers, pesticides etc., and better agronomic practices—which produce better results when interacting on each other. The main principle is the complementarity of inputs, so necessary for intensive modern agriculture.

"Balanced supply of plant nutrients, adequate moisture in the rooting zone of the soil, well adapted crop varieties of high genetic potential and plant (and animal) protection—all these four essentials must be changed simultaneously ; rarely can economic progress be made only with one change."⁷

Hitherto, the development effort was spread on a fairly uniform basis throughout the country viz., treatment of all areas on an equal footing ; no wonder it failed to produce the desired results. Spreading them too thin, it only wasted



rare resources. Change came under the twin principles of concentration and complementarity.

A pilot programme was started in Oct. 1959. The first decisive step was to apply it in selected areas, enjoying optimum favorable conditions, an integrated approach based on whatever improved technologies were already known and could be immediately applied and to build further on this foundation by incorporating new results of research and experiments as soon as they became available. This 10 point programme to increase food production had the following elements :—

- (i) adequate and timely supply of credit on the basis of production plans—supplied by Cooperative Societies ;
- (ii) adequate and timely supply of production requisites such as fertilisers, pesticides and implements—all channelled through cooperatives ;
- (iii) arrangements for marketing and other services ;
- (iv) intensive educational efforts especially through scientific demonstrations, to disseminate improved agronomic practices
- (v) adequate storage facilities for supplies such as seeds, fertilisers, pesticides, implements and for farm produce ;
- (vi) transport arrangements to ensure mobility of supplies and staff.
- (vii) village planning for increased production through strengthened cooperatives and panchayats.
- (viii) establishment of agricultural implements, workshops and of seed and soil-testing laboratories ;
- (ix) formulation and execution of local works programmes having a direct bearing on production increase ; and
- (x) analysis and evaluation of the programme.

These points were not new. What was new was the simultaneous application of these points in optimum favorable conditions to obtain maximum production increases. This was the beginning of the IADP—an innovation which gave a jolt to India's static agriculture even before the arrival of dwarf seed varieties on the scene.

Farm Plan and other Essentials

This comprehensive programme of IADP, consisting of two related packages of inputs and services, was aimed at one single objective of raising farm productivity. A good farm plan was the 'sine que non' of this programme. It was to be prepared by competent men with requisite scientific and practical experience, assured of the essential production inputs, followed by an assurance of enough production credit (crop loan). This plan was to emphasise the *added cost* and *added return* for each crop due to improved practices—to appeal to the farmer's economic instinct. Production inputs were to be made available on the basis of estimates worked out in the plan. Cooperative societies were to provide short term production

loans based on the production plan. In addition, a farm plan proforma was developed to suit the needs of each area characterised by similar conditions.

The crop loan concept was not new but the emphasis was; loan was to be given, based on credit-rating not of the farmer but of the farm plan. To be effective, such loans must be geared to a production-boosting programme based on improved methods and technologies. This was so in the IADP farm planning.

The integrated approach of the 10 point programme mentioned already was most vital; any deficient component would affect the anticipated results. Institutional support came through the Cooperative, Community Development and Panchayati Raj agencies, for historical reasons.

The pilot programme was to be introduced in the first instance in 7 states, one district in each, four rice growing, two wheat and one millets:

Shahabad in Bihar, Thanjavur in T.N., Aligarh in UP, West Godawari in AP, Ludhiana in Punjab, Raipur in MP and Pali in Rajasthan.

The criteria for the selection of districts were assured supply of water, a minimum of natural hazards like floods, drainage or acute soil conservation problems, relatively well developed village Institutions, cooperatives and panchayats, viz., a maximum potential for increasing output within a comparatively short time, and so on.

The Government of India gave the green signal on 11 June 1960 but it desired the programme to be extended to all the 15 states. So a second group of 8 districts was selected—for political reasons:—

Alleppey and Palghat in Kerala, Cachar in Assam, Bhandara in Maharashtra, Burdwan in W. Bengal. Mandya in Mysore, Sambalpur in Orissa, Surat in Gujarat, Jammu and Anantnag in J & K.

These 15 districts of the IADP together covered about 5 per cent of India's villages, about 6 per cent of C.D. Blocks in their gross cropped area and population. Only 33 per cent of the area of these districts was irrigated. The districts were far from uniform in the level of development, that is, in agriculture or agricultural institutions. They belonged to different agroclimatic zones; the size of farms was varying; irrigation facilities were of different intensity. Use of fertilisers in the outset of the programme was of different levels. Ludhiana in Punjab came somewhere in the middle category, though in the average size of holdings at 7.5 acres and in communications it was leading. Crop yield data also showed wide differences among the districts; so did the infrastructural facilities—relatively good in Ludhiana and very poor in Raipur (M.P.).

In the overall, the selected districts were not exceptionally but only marginally more favorable than the rest of the country. The programme itself was introduced in these districts gradually. A target of 20 per cent cultivated areas was suggested for the first year, a gradual rise upto 65 per cent or more in the next three years—the balance in the fifth year. Staffing took time, almost 12-18 months. Even then

the gaps in the supply line were unsatisfactory. Extension workers lacked knowledge, equipment and adequate training to do justice to their tasks. The preparation of the farm plans had to be on a trial and error basis. Supporting services were established after a considerable time lag. Continuity of staff was disturbed by frequent transfers as usual in our system.

In spite of these inevitable shortfalls, the IDAP did manage to establish for itself an impressive record of achievements—a most heartening prospect. According to Dr. Johnson, some districts were reaching the first fruit bearing stage when the severe drought struck in 1965. To sum up

- (i) IADP had created a new dynamism in the stagnant countryside and a demand from farmers for better inputs and facilities. The government machinery also became conscious of the needs of modernisation process. While working on the IV Plan, C. Subramaniam, the Central Minister for Agriculture observed :

“It is one of the miracle stories of modern development that the allegedly backward, tradition-bound Indian farmer has been so responsive to the new technology. This has been in a large measure due to the pioneering efforts of the IADP through which the package approach to agriculture was introduced.”⁸

- (ii) The IADP played an active role in developing the new strategy for the IV Plan in formulating the hyvp and in implementing both; since indigenous seed varieties were not responding adequately to fertilisers, and higher production targets were fixed for these districts, the switch over to hyvp was quicker than the rest of the country.
- (iii) The IADP sought to improve staff operations and succeeded. A unified leadership emerged in the project officer assisted by a team of specialists. By the time hyvp came in, the staff had picked up the experience of farm planning and an adequate supply line.
- (iv) The IDAP concept earned recognition in 1964-65 when it was extended to 114 districts under the name IAAP (Intensive Agricultural Area Programme)—the basic approach being the same as that of IADP.
- (v) The IDAP helped large farmers, no doubt, but it also involved medium ones in the modernisation process. It is the latter class which through intensive farming (5 hectares and below) helped solve the nation's food problem and assured a better future for themselves.
- (vi) In input-use technologies, IADP has made great contribution both by inducing improved practices and methods and by pinpointing the deficiencies based on actual field experience. For example the neglect of water use and management was first pointed out by the IADP. Fertiliser use had been popularised by it. It became ten times in the IADP districts; plant protection measures also increased six times.

- (vii) IADP stressed the importance of modernising the rice processing industry; the Govt. of India set up 4 modern rice mills and organised training for it. Soil-testing services was set up in all the IADP districts.
- (viii) Compared with the base period 1958-61, wheat production increased by 260 per cent, maize 100 per cent and rice by 38 per cent.

There was some criticism of the IADP in the country. It was said that the concentration of resources had favoured a limited area, discriminating against the rest of the country; the IADP had made rich farmers richer and poor ones poorer; the IADP district was overstaffed; the IADP district was not a logical unit, it was only an administrative and not a farm district; the whole exercise had virtually amounted only to the supply of fertilisers, seeds and pesticides; the IADP districts were advanced districts and they progressed further not so much because of the IADP; the IADP did not take to water use and management though it was recommended in the Crisis Report of 1959; the IADP efforts to increase production were a failure until the arrival of the *hyv* seeds and production increased with traditional seed varieties also when inputs were available and lastly that agricultural programme could not be "packaged" any way.

This criticism, inevitable in a democratic set up, was somewhat lopsided. There was no harm in developing the advanced districts further to fill the country's bread basket, obtaining best returns on investment of resources. The IADP was also a demonstrative effort which on success was succeeded by the IAAP. Its real significance was overwhelmingly educational—a super-demonstration project to discover what it takes to develop tropical agriculture. As a production-oriented action programme it allowed little leeway to stray from the realities. Its down-to-farm approach compelled all concerned to grapple with the problems constantly—to learn by doing and seeing as new technologies and practices were introduced and actually tried out in the field.

"Illorganised supply and distribution of inputs, inadequacies of production credit, poor water management, fitful research unrelated to production problems, low quality extension service, weaknesses of the administrative system, lack of transport etc.,—all these deficiencies were thrown up under the IADP and their crippling effect on production vividly brought home to all concerned the need of the hour, forcing the government to adopt remedial measures."

This was the adoption "*break-through*" which was available as soon as the biological break-through came on the Indian scene, both leading to the advent of the Green Revolution to India in the later sixties.

Data showed that 64 per cent of the growth in the output of foodgrains in the IADP districts could be attributed to capital and knowledge—viz., factors other than land and labour inputs. Capital and knowledge, in the shape of technical change, involving the use of *hyv* seeds, fertilisers and pesticides etc., had become major factors in agricultural growth in India.

In Part (i) of this Chapter we referred to the fact that in order to be successful

biological engineering-the starting point of the Green Revolution-must be accompanied by socio-economic engineering. An aspect of that latter engineering has been explained in this Part, (ii) Another will be implied in the Chapter which follows. Suffice it to say here that the hyv seeds "yield their stored wealth only when they are cultured with the requisite skill and care and they will be so cultured only when the skills are properly taught, the needed ingredients are adequately supplied and facilities are provided to garner the wealth and to turn it into Cash."⁹

NOTES

1. The term "Green Revolution" was first used by the then Administrator of the U.S. AID, William S. Gand on 8 March 1963 in Washington D.C. when he addressed the Society for International Development on the subject "Green Revolution—Accomplishments and Apprehensions".
Source : Robert F. Chandler, former Director IRRI in his article "The Physical & Biological Potentials and Constraints in meeting World Food Needs"—Proceedings of the World Food Conference 1976, IOWA (USA).
2. Sudhir Sen, "A Richer Harvest", *Ibid.*, p. 31.
3. Sudhir Sen, "A Richer Harvest", p. 39.
4. Sudhir Sen, "A Richer Harvest", p. 65.
5. Sudhir Sen, "Reaping the Harvest", p. 7.
6. Ford Foundation's Report—Report on India's Food Crisis & Steps to meet it 1959, pp. 146-151.
7. Charles E. Kellog "Interactions in Agricultural Development—Paper in the World Food Congress held in Washington D C. June 1963.
8. Quoted in Sudhir Sen's "A Richer Harvest", *Ibid.*, p. 177.
9. Sudhir Sen, "A Richer Harvest" *Ibid.*, p. 65.

New Strategy of Agricultural Production

[The Birthpangs of Green Revolution in India]

Around the time Dr. Borlaug's dwarf wheat seed varieties were on trial in India in the early sixties, C. Subramaniam became the Cabinet Minister for Food and Agriculture (1964-67). He took to these seeds in right earnest for he saw in them a great potential for solving India's food problem. He evolved a new strategy of agricultural production in consultation with the country's scientists and administrators working with him, convinced the Government of India of its efficacy and then went all out to put it on the ground with maximum speed. During the course of his tenure he availed of every opportunity to put his ideas in a most lucid and simple phraseology across to the audiences consisting of scientists, agronomists, administrators, field workers, agricultural universities, farmers' cooperatives and the peasantry. Simultaneously, he took all requisite steps at the ministry level to create conditions and facilities for implementing the new strategy. His message dwelt on all the components of the new approach, including a new deal for the scientists, priorities in agriculture, spread of hyv programme, agricultural prices, marketing, administration and research, package programme, fertiliser production and supplies, food distribution cum price policy, better agricultural statistics, agro-industries, role of voluntary agencies in agricultural development—and what not. His relevant speeches are collected by the ICAR in a volume called "A New Strategy in Agriculture" published in 1972.

In the year 1978, C. Subramaniam gave a series of lectures on the invitation of the Australian National University as a Visiting Fellow in the Department of Economics, Research School of Pacific Studies and the Development Studies Centre Sydney. Sir John Crawford was the Chancellor of that university. These series of lectures relating to his experiences about the introduction of Green Revolution in India were given to the students of the Master's Programme in Agricultural Development Economics (MADE). These covered the New Strategy of agricultural production introduced from 1964 onwards. His contribution to

the successful launching of the Green Revolution in this country and much of its development in the subsequent years were due to his continuing interest in the subject even when he was not directly responsible for it.

He was so sure of the new strategy that he made it an issue to give an economic and incentive price to the farmer for his grain. L.K. Jha Committee on prices appointed in 1964 recommended an ad hoc increase of 5 per cent in the procurement prices. Agricultural Prices Commission (APC) was set up in Jan. 1965 to emphasise the following in its terms of reference, interalia :

- (i) the need to provide incentive to the producer for adopting improved technology and for maximising production;
- (ii) the need to ensure rational utilisation of land and other productive resources;
- (iii) the likely effect of price policy on the rest of the economy, particularly on the cost of living, level of wages, industrial cost structure etc.

The APC was soon followed by the Food Corporation of India (FCI) to make support price purchases when necessary. The APC and the FCI were to be the twin arms of the strategy of production which made a beginning at the marketing end. Psychologically this approach was understandable and highly imaginative. Simultaneously, the Minister had announced that production could be increased only with the introduction of science and technology into farming. To this end he encouraged the IARI scientists to introduce scientific methods of crop management, as against the approach of the traditional agriculturist. ICAR itself was reorganised and all the national level institutions brought under its direct control. An Agricultural Research Service was set up in the states. It was recognised that if India was to launch a new technology without scientific and technological competence, it might end in a disaster. Agricultural science had to be put on a firm foundation so that research work could be undertaken to meet the new challenges and problems.

Dr. Ralph Cummings of the Rockefeller Foundation in India introduced the new dwarf wheat and rice seeds to Mr. C. Subramaniam who initially set up three panels—a scientist's panel, a panel of agricultural economists and a panel of agricultural administrators. Though Senior scientists were conservative in outlook,

“the younger generation took a more dynamic stand saying we should progress now that this technology was bound to yield results and, therefore, we should take a bold decision and proceed with the introduction of the new varieties on a large scale.”¹

The economists' panel wanted to study the proposal in detail. Political opinion was adverse to the proposal. High dose of fertilisers would mean bigger imports thereof and some of them believed “we would only mortgage our future to the foreign interests, specially American.” Cabinet too advised caution. It was,

however, decided to introduce new strategy and new varieties of seeds in the year 1965-66 sowing season ; one year was thus lost but as a part of the tactical approach to the main goal in conditions of Indian democracy. This period was really gainfully employed in convincing the various interests about the utility of the new strategy. That its adoption would lead to greater social tensions was also mooted but it could not be an argument against the adoption and implementation of the new strategy. C. Subramaniam felt it was absurd to argue in that fashion; no one had even insisted on equality of benefits as a result of industrialisation. Why so in the matter of an agricultural development strategy ? He said

"I asked : would you like to have such high production and attain selfsufficiency within the country and face these tensions by distributing these foodgrains on an appropriate welfare basis or would you prefer to continue dependence on foreign imports indefinitely ?"²

Ultimately many came to the conclusion that perhaps it would be better to raise output in India even though it might create other problems.

After selecting new seed varieties, seed multiplication on a large scale was needed. From nucleus seed to foundation seed, then to controlled seed producers, before the actual farmer got his share of the new seed—all this had to be organised and coordinated. A National Seeds Corporation and State Seeds Corporations were set up. Big seed farms had to be organised also for multiplication, minimum of 200 hectare size or more, managed by a State Farms Corporation at the centre, with smaller ones at the state levels, similarly. Seed, in short, had to be developed, tested, multiplied and processed and stored to maintain its quality, purity and performance capability—an industry by itself.

In regard to the use of fertilisers—and the new wheat varieties required very intensive doses of fertilisers, even 60 to 70 kgs per hectare—the controversy arose whether it was better to use the available, indigenous and mostly imported, resources in an intensive manner or spread its use at the rate of 5 to 10 kg/ha extensively, to secure bigger output in the end. The protagonists of the latter course were not aware of the potential of the dwarf wheat seeds which gave a much higher yield as the fertiliser dose went beyond 10 kg/ha upto 60 kg. They were correct in so far as the cultivation with traditional varieties was concerned. In the end it was agreed by all that if India went in for large scale fertiliser production, high dosage levels on an intensive area basis for the new varieties were bound to yield better results.³

Not only that; there was the controversy over the relative merits of chemical and organic fertilisers—the latter improves the soil whereas the former burns it. It had to be sorted out. C. Subramaniam was a man of conviction, with a lot of patience and tact. He won in the end and got the necessary foreign exchange for the import of chemical fertilisers.

To apply these fertilisers in high doses, a more intimate knowledge of the soil was required, to avoid other problems later. Soil analysis, in the normal course, for the traditional cultivation was much simpler and less intensive. A new soil

survey programme had to be formulated and organised for intensive field to field survey, a "horoscope" for each, as he called it.

The watering pattern for the crops from new varieties of seeds was also different; it was difficult to fit it in with the traditional irrigation systems meant for traditional varieties. Our normal system provided for water going from field to field, by flow irrigation within a water shed. Irrigation of any particular field could not be controlled unless the entire inlet flow was blocked. Here if high doses of fertilisers were applied in one field, it was bound to flow with the water into the adjoining one. Then for the paddy crop, water must stand in the field at least 150 mm, to curb the growth of weeds. No weedicide had come into use then. For new varieties of seeds controlled water was a must, anyway.

Expanded Extension Services and Demonstration Centres

Adequate extension services were required to convey the message of the new technology to the farmers. The Panchayati Raj Institutions were in a sense available with their VLWs, Block Samities, BDPOs, subject matter extension officers, Zila Parishads and so on, covering the entire country. The concept of a block as a compact area for agricultural development had been accepted much earlier. The extension agencies were located at the block headquarters. The VLW was the kingpin of the agency, playing a multi-purpose role. It was he who was coming in touch with the farmers. But he being multipurpose, and with a big area to cover, was thinly spread and in practice was a "jack of all trades and expert in none." He had naturally to be retrained for the new technology to act as an extension officer for only agriculture—new agriculture—and his jurisdiction was also to be curtailed, to become more effective. That was the initial change necessary in the concept and coverage of this extension agency of a VLW.

C. Subramaniam thought of big but attainable aims and objectives⁴—whether for the spread of wheat dwarf seeds or for rice 'miracle' seeds. The problem of entire area coverage being colossal, it was realised that small efforts would be self-defeating also. It was necessary to think and act reasonably big. Consistent with this approach, a lot of homework had to be done by the departments, agricultural universities and others to produce the requisite inputs, create an adequate research and training base, commensurate with the needs of a dynamic programme of agriculture. Then for better soil management, weed control, irrigation techniques and implements had to be provided for.

Initially in 1965 only 200 tonnes of hyv wheat seed was available. When the success of demonstration farms came to be known there was great demand for it. A special team had to proceed to Mexico and bring 18000 tonnes more of it. It was this seed which set in motion the chain-reaction in 1966-67, not only in India but elsewhere also. A programme of national demonstration had in the meantime been initiated in 1965. Mass communication media, radio and cinema (T.V. came later) were fully exploited for passing information about the new agronomy for higher yields. Farmers came to see the demonstration farms as pilgrims.

The Government of India thus took the initiative in introducing the new strategy through the hyv programme, focussed mainly on research, demonstration and extension plus the rigorous supply of inputs and credit. The programme, as observed, had to be implemented by the farmers. The big farmers were naturally in the forefront but the small ones also followed as soon as their difficulties of credit etc., were to some extent provided for by the organisation of cooperative societies. Fertiliser supplies were short in the beginning and had to be rationed on the basis of area targets. Sometimes these had to be diverted from other areas. Soon the small and marginal farmers' programme had to be started to provide to them special credit facilities and various other essential inputs in a preferential manner.

Wheat production in the country in 1961 was only about 11 m.t. In 1971 it had crossed 23 m.t. Between 1970-74 there was some stagnation mainly due to deterioration in the quality of the seed and shortage of fertilisers (because of the oil crisis and all that). Once in five years at least the farmer must change the seed and the same must be made available to him in the shape of new wheat varieties, taking into account the many defects like rust, diseases and drought proneness of the previous ones. Fresh research and development was needed constantly.

On the ground, the Punjab and Haryana farmers acted as the pioneers of this new technology. They were used to innovations, new ideas and had the knack to survive even in adverse circumstances. Infact, they now set the pace for a new agricultural revolution in India and showed the way to increased agricultural production. The production of wheat multiplied by leaps and bounds literally. The farmers there took to rice growing as a cash crop under new hy varieties. Soon thereafter they even went in for a third "catch" crop, having gone in for mechanisation and modernisation. It was found in practice that after introduction of tractors and harvesters etc., more labour was needed for multiple cropping, particularly during post harvesting operations. Employment was provided indirectly in the shape of new servicing operations also.

The problems of coordination between agriculture and irrigation departments had to be tackled at the implementation level. Traditional agriculture was used to irrigation department's timetable for water release/closure and opening of reservoirs etc. New type of agriculture, however, needed as said before controlled irrigation and systematically according to needs. The installation of private tubewells served this new purpose of irrigation better. Where ground water was available, tubewells could be installed as supplemental to canal water. This, incidentally, helped the canal water-logged areas also. It was established that many adjustments and innovations were required, in concept and practice, to bring the new technology on the ground successfully. One thing led to another : tubewells required electricity for which a major programme of rural electrification was undertaken, in Punjab and Haryana particularly. Intensive programme of marketing of produce led to a big programme of link road construction and other means of transport—as a necessary concomitant of the new technology of agriculture.

The picture on the rice production front, especially in the traditionally rice-producing areas, was not as bright as on the wheat side. The new rice varieties

provided by the IRRI and various rice research institutions had to face a wide range of conditions including monsoonish cloudy weather and moisture favourable for pests and diseases. An intensive programme of adoptive research was needed before a particular region could use hyv seeds developed elsewhere. Not only that : extension work for rice cultivation had to be more intensive and more intelligent, requiring a specialised training among the VLWs and a particular orientation among the farmers.

In 1965 India had approached IRRI for the supply of one tonne of TN-1 seed and airlifted it. More seed was obtained from Taiwan direct—which was promptly multiplied and distributed by the National Seeds Corporation. In 1965-66 TN-1 was sown in 60,000 hectares. About the same time came the news of IRRI developing the IR-8 seed which was obtained. The results were uniformly reassuring. The area under IR-8 rose from a token level of 12 hectare in 1966 to 1,00,000 hectares in Kharif 1967 and 1.5 million hectare a year later. The hyv programme in rice had multiplied rapidly. This also helped the country's food supply position in the short run.

Problems arose; even the best rice varieties have to be adapted to local conditions. Rust was a problem with TN-1; then the monsoon damp also produced disease and leaf blight. Water supply was to be regulated both for TN-1 and IR-8—erratic flushing would not do. Of course, these varieties were insensitive to photo-period or day length and could grow in short period but in high humidity there was danger of the grain germinating. The contrast with Indian varieties was acute. "The tall indica rejects fertilisers and gives a pathetically low yield of fine quality rice—the dwarf avidly absorbs fertilisers and gives a fantastically high yield of coarse rice—not relished by the consumers."⁵ Could the two seeds be married together?

The answer came towards the end of 1968 when hybrid Jaya and Padma varieties were evolved and released by Indian scientists. These could stand up well, in yield and other essential attributes against both TN-1 and IR-8.

Says Mr. Carrol P. Streeter in his "A Partnership to improve Food Production in India"—A Report from the Rockefeller Foundation, New York 1969 :—

"India's wheat and rice programmes have been like two powerful jet planes at the Airport. Wheat rolled down the runway first and is now well aloft. Rice has only barely lifted off the ground but it is beginning its climb."

The use of hyv of wheat and rice led to food production and higher agricultural incomes. Not only that; before the end of the pipeline there were other benefits in the shape of changes introduced in the whole production process and the resulting numerous job and income opportunities like (i) a seed industry; (ii) a rapid development of tubewells and other irrigation facilities; (iii) a spurt in fertiliser consumption; (iv) increasing use of pesticides for plant protection; (v) a surge in the demand for farm machinery—viz., tractors, threshers, seed-fertiliser drills, driers etc., (vi) growing emphasis on multiple cropping; (vii) rural electrification; (viii) expansion of fertiliser and pesticide industries; (ix) increasing road construction for linking villages with main roads for marketing; (x) agro-business of various types, including expansion

of agricultural credit—all these come as direct results of the adoption of dwarf wheat and rice—not necessarily in that sequence though.

All these results become clear as one sees the growth of foodgrains production in Punjab and Haryana in the post 1966-67 period. It is a remarkably heartening story which was the outcome of a well coordinated effort of all concerned—the scientists who evolved the dwarf seeds, the political bosses who gave the inspiration and the go-ahead signal, the technocrats and the bureaucracy who spread the message and then the farmers who accepted the challenge and carried out the instructions for their own benefit and the welfare of the country. As simple as that, it looked.

C. Subramaniam observed as under “The Punjab and Haryana provide a story of agricultural development on a scale and speed which had not been witnessed before in any part of the world. If only we could repeat this miracle in other areas, the food problem and problems of rural unemployment and of agricultural stagnation in other areas would be solved. Unfortunately natural conditions do not permit this nor is such a human enterprise available in other areas. Our task, therefore, has to be to train the human material and to provide the incentive for participation in these development programmes.”⁶

Let us develop this argument later, by studying the case of the four states of Punjab, Haryana, U.P. and Bihar, in their reaction to the Green Revolution technology.

NOTES

1. C. Subramaniam—“The New Strategy in Indian Agriculture” Vikas, New Delhi 1979, p. 23.
2. *Ibid.*, p. 27.
3. Towards the end of the Third Plan it began to be realised that spreading scarce resources thinly over large areas did not lead to their optimum utilisation and to the maximisation of production of foodgrains. In the Fourth Plan, therefore, the policy was to concentrate effort in areas with adequate irrigation facilities or assured rainfall which promised greater response to the use of improved seeds and fertilisers. As a matter of fact the new strategy had itself meant cultivation of *hyv* crops under a complete package of improved agronomic practices to exploit their maximum potentialities.”
See also K.S. Mann’s, “Analysis of the Expected Shifts in Cropping Pattern in the Punjab resulting from *hyv* crops” P.A.U. Ludhiana, 1967.
4. When C. Subramaniam talked of covering 1/10 of the 130 mha of cropped area in the country with *hyv* seeds in 1965-66, and the four years following, through assured irrigation and selected progressive farmers, the experts from the Ford and Rockefeller foundation advised caution and the adoption of less ambitious targets. The experts from socialist countries advised collectivisation of small farms. The minister was in a dilemma. He again conferred with his

own panels of scientists, economists and administrators and thought of setting up demonstration farms, 1000 in number belonging to farmers, to prove that an additional yield of 200 to 300 per cent could be achieved by the adoption of new technology. The resistance of the traditional farmer could be broken only by actual field demonstration; how else would he 'fall in' quicker? This was an excellent idea which carried the day. In the midst of traditional agriculture these 2 hectare fields were cultivated with the new technology in 1965-66 kharif and rabi seasons. See "The New Strategy in Indian Agriculture", *Ibid.*, pp 47-48.

5. Sudhir Sen 'A Richer Harvest', *Ibid*, p. 53.

6. "The New Strategy in Indian Agriculture" *Ibid*, pp. 59-60.

PART TWO

Components of the Green Revolution

General

The success of the new strategy in agricultural development—broadly called the Green Revolution (G.R.)—depends on its package approach; high yielding variety (hyv) seeds, fertilisers, controlled water supply, insecticides and mechanical equipment are the main components but to achieve optimum results from the investments and the effort put into cultivation, certain actions precede the operations in the field and certain others succeed those operations after the harvesting stage. The former category includes things like consolidation of fragmented holdings, as a part of the land reforms programme or independently; preparation of the land especially under command area development (CAD) schemes; supply of agricultural credit, short, medium and long term, whether given by government departments, co-operatives or commercial banks; institutional arrangements for research, education and extension in agriculture through agricultural universities and/or agriculture departments; and last but not least, rural electrification to work the tubewells and mechanical equipment. The latter category would include post-harvesting operations, rural roads and marketing, price support operations preceded by remunerative price fixation to safeguard the interest of the farmers.

Even under normal but progressive/advanced agricultural operations some of the above components are required but under 'Green Revolution', all the above mentioned components assume a different significance since the 'miracle seeds' are the core of the package and they set their own conditions and working environment from the logic of which it is not possible to escape, in time as well as in space. These seeds, evolved through selective breeding, are highly responsive to fertiliser input; their vulnerability to pest attacks and the growth of useless weeds from heavy fertiliser input etc., necessitate the use of pesticides and herbicides; their full potential would not develop without a controlled supply of water (not the field to field flooding type we have in our canal irrigation); being given to a shorter maturing

period, which enables more than one crop a year on the same land, the harvesting operations have to be hastened, the land prepared quickly for the second crop—all this necessitating the use of some mechanical equipment like threshers and even tractors, to avoid bottlenecks and so on. In short, the hyv seeds would not achieve full potential without water and fertiliser, their output would be highly variable or even decline heavily without the use of pesticides and herbicides, and their potential for multiple cropping would not fructify without some mechanisation of operations.

We will deal with the above mentioned components of the G.R. in the following order. It is not possible to prescribe a strict sequence thereof in point of time—certain components have to be arranged simultaneously, certain others one after the other. Some of them require a long period in becoming available, infact most of them have to be planned whether physically, organisationally or institutionally over time. Relying on the experience of Punjab a sequence is spelt out below—and their elaboration will follow in that order—but there is no real sanctity about the sequence nor does it mean that a component mentioned later in the list is of any less importance than those preceding it :—

- (i) Consolidation of Land holdings
- (ii) Land Reforms—Need for
- (iii) Hyv Seeds
- (iv) Irrigation (a) surface and (b) ground water
- (v) Command Area Development
- (vi) Use of fertilisers (chemical)
- (vii) Use of Insecticides and Pesticides
- (viii) Supply of agricultural credit
- (ix) Rural Electrification
- (x) Rural Roads and Marketing
- (xi) Farm Mechanisation
- (xii) Agricultural Universities.

We are not going at all into the organisational, institutional, manufacturing or supply arrangements for these components. What follows under the above headings gives only the essential aspect of these components. Nor do we propose to go into the package of down-to-earth agricultural practices, as distinct from package of input components, since the task will be too huge to be contained in a single book like this. Each new input brings with it a set of new cultural practices and the farmer must know the why, where, what, when, and how much of each etc. This aspect of the problem will be covered by the extension agencies in the field, whether departmental or of the agricultural universities.

(I) CONSOLIDATION OF LAND HOLDINGS

It is generally accepted that in India a major cause of low productivity in agriculture is the fragmentation of land holdings. Wherever there has been con-

solidation thereof, as in Punjab and Haryana, a spurt in foodgrains production has resulted. The importance of consolidation has been stressed repeatedly in all the plan documents but only in the IV Plan its rigorous pursuit was recommended.

Not only there is a wastage of land and effort in dealing with scattered holdings by an owner, major improvements in agriculture cannot be introduced therein easily. For example, canal irrigation is not possible in scattered plots nor can tubewells be sunk there and utilised economically. Cattle trespass and other disputes become of a frequent occurrence among neighbours. Overall effect of this is a severe under-utilisation and wastage of farm resources.

The Punjab state took the lead in consolidation of holdings on a voluntary basis under the Cooperative Consolidation Societies Act 1912 (a Central Act) though the actual work was commenced only in 1920. There was not much success for various reasons—nor in states like UP and CP. Punjab and UP again started with their own consolidation acts, in 1936 and 1939 respectively, introducing some compulsory clauses but again the effort failed as public support was lacking.

It was only after 1947 that the matter was taken up seriously and statutorily compulsory consolidation took the place of voluntary consolidation in all the states at different levels. Bombay took the lead in 1947, Punjab followed suit in 1948—then came UP, HP, Rajasthan, West Bengal, Andhra and Bihar. Implementation was uneven in the states; whereas Punjab and UP had set up separate organisations for this work and the entire area was to be covered by the scheme, the other states left the work to the normal revenue administrations only. It did not work.

The East Punjab Consolidations of Holdings and Fragmentation Act 1948 was introduced with an element of compulsion; the progress in implementation was rapid as the enlightened peasantry, guided by a well meaning and determined political leadership, adopted the programme in right earnest.

According to the Act

- (i) the preliminary work of the staff was the correction of and updating the record of peasant's rights and the preparation of a preliminary statement;
- (ii) village advisory committees were formed to advise the staff on all matters concerning consolidation and, in particular, on the classification and valuation of fields and later the preparation of village consolidation schemes;
- (iii) the evaluation of plots was done on the basis of the quality of the soil, the source of irrigation, the productivity of land and distance from the village abadi;
- (iv) irregular fields were to be consolidated into rectangular blocks of one acre size;
- (v) opportunity was available to replan the countryside, including planning the location of schools, roads and hospitals, land earmarked for community buildings, play-grounds, places of worship, a road running around the village, roads linking one village to another and then on to main roads.

All operations were time-bound in that a time limit was fixed for completion of every stage, including disposal of cases/appeals (only two such appeals were allowed). The landtitle cases, including correction of records, were shifted to consolidation courts for quick disposal. Consolidation law was independent of the central/state laws relating to ownership, disposal and other treatment of agricultural land. The following stages of operations were adopted chronologically :—

- (i) initiation of proceedings;
- (ii) formation of advisory committees at state, district and village levels, with decision-making powers at village committee level;
- (iii) correction of revenue records and maps;
- (iv) settlement of title disputes;
- (v) valuation of land (based on either productivity, or market value or rental value—productivity criterion being most equitable) for purposes of exchange;
- (vi) statement/adoption of principles of partition of land;
- (vii) reservation of land for common purposes, including for planning and development, thus reducing the land for allotment—deductions of lands to be taken as a contribution by the tenure holders/owners in proportion to their holdings;
- (viii) coordination between consolidation and other departments;
- (ix) framing of the consolidation/partition schemes—its preparation, publication and confirmation;
- (x) transfer of possession ;
- (xi) revision of records including preparation of new record of rights ;
- (xii) denotification of area under consolidation.

The tenure holders and the sharecroppers would have the same rights and title to the new areas as they had earlier. The preservation of security of tenure to them had priority in the scheme. They were all identified and their rights recorded and permanent heritable rights conferred on them before consolidation proceedings started, to obviate the possibility of ejection later. Common village lands were also consolidated in one place and lands were reserved for habitation sites, to be earmarked for individuals and harijans etc.

Para 15.4.22 of the Report of Commission on Agriculture 1974 contains the following remarks on the benefits of consolidation :—

“The benefits of land consolidation are realised when various agricultural development programmes relating to irrigation, land reclamation, soil conservation, communications and different agro-economic facilities are undertaken to take full advantage of the scheme. The effectiveness of land consolidation in India is more evident in the sphere of irrigation. It is necessary that, alongwith rectangulation, each village should be contoured and water channels proposed jointly by consolidation and irrigation agencies. The services of an agronomist and an expert in soil conservation are also essential for the work.

It would be desirable to align soil conservation with consolidation for which joint schemes should be drawn and implemented after consolidation has been completed".

With consolidation of holdings in the Punjab the sinking of tubewells became possible, land leasing was reduced and owner cultivation increased. Not only that : cultivable area also increased by reduction of embankment : canal irrigation was optimised—all this led to increase in agricultural production even prior to the onset of the Green Revolution in 1964-65. Infact the ground was prepared in abundant measure through consolidation of holdings to get full benefit from that Revolution. According to Dr. M.S. Randhawa :

"If Punjab has provided for such a sound base for intensive agricultural activity, particularly for hyv mexican wheat requiring frequent irrigation, it is entirely due to consolidation of holdings. This was achieved on account of sound political and administrative rural-based leadership. The contribution made to the scheme of consolidation by ministers like Gyani Kartar Singh and Partap Singh Kairon is by no means small. When the scheme was formulated there was much talk in the air about cooperative and joint farming in which the entire land, cattle and implements were to be pooled [Infact, that was suggested as an alternative and a cheaper one too]. But the experience has shown to the contrary. The political leadership realised that, instead of building castles in the air, it was better to launch the scheme of consolidation of holdings which the keenly felt need of the Punjab farmers, who knew that farming was best done by a hardworking family who were bound together by family ties and realised that schemes were no substitute for hardwork which people put in with the profit motive which might be ignoble but was there and could not be igored".²

Now the rural landscape in the Punjab is marked by large areas demarcated into rectangles, spotted with a large number of tubewells at regular intervals, with straight roads linking villages with fields and market towns. This work was facilitated by consolidation of holdings which not only demarcated land for the roads out of the common pool reallotment ; the operation also made available a lot of area for cultivation which was previously lost in embankments. Besides, it helped the farmers to sink tubewells on their holdings now consolidated in one place. "The experts have estimated that the process of consolidation of land holdings has alone contributed about 25 per cent towards increase of agricultural production in the state."³

The progress of consolidation of holdings in the country has not been very satisfactory as would appear from the Table 8 on the next page.

Very good work in a couple of states was rather an exception than the rule. K.N. Raj makes the following observations :—

"Despite the critical importance attached to consolidation of holdings, for

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TABLE 8
Progress of Consolidation of Holdings

(Area in '000 ha)

State	Net sown Area	Total culti- vable Area	Area consoli- dated upto IV-Plan 1972-73	Fifth Plan Target by 1979-80	Fifth Plan upto (consoli- dated) 79-80	Sixth Plan Total conso- lidated till March 1985
1	2	3	4	5	6	7
Andhra	11,269	15,498	355	—	331	331
Assam	2,235	2,700	—	—	—	—
Bihar	8,276	11,535	300	607	643	769
Gujarat	9,322	11,062	1,207	405	1,264	1,831
Haryana	3,567	3,763	183	121	306	320
Punjab	4,076	4,282	9,126	—	9,020	9,041
Himachal	548	773	233	16	226	306
J & K	706	972	23	—	47	47
Kerala	2,187	2,310	—	—	—	—
Karnataka	10,331	12,418	1,009	810	1,083	1,083
Maharashtra	16,576	20,800	9,768	6,073	14,027	16,699
Manipur	140	140	—	—	—	—
Madhya P	18,461	22,128	3,552	1,215	3,866	3,866
Meghalaya	162	162	—	—	—	—
Nagaland	62	62	—	—	—	—
Orissa	6,119	7,608	—	—	46	368
Rajasthan	15,263	25,021	1,730	—	1,712	1,712
Tamil Nadu	6,348	8,228	—	—	—	—
Tripura	240	247	—	—	—	—
UP	17,317	20,095	1,1773	3,036	13,350	15,170
West Bengal	5,712	5,872	—	—	—	—
Other Union Territories	448	892	87	—	—	—
All India Total	1,39,265	1,76,568	39,326	14,000	46,178	51,800

Source :— (i) Report of the National Commission on Agriculture 1976, Vol. XV, pp. 233-234 (upto column 5).
(ii) Proceedings of conference in Land Reforms etc. 18 May 1985, New Delhi, Government of India, pp. 157-58.

improvements in land and water management, remarkably little attention appears to have been given to it in most parts of the country in the last decade. Punjab, Haryana and Western UP, which made an earlier start with consolidation, are reported to have completed the work; they have also demonstrated the potential it carries for raising agricultural productivity. However, according to the Planning Commission, even a beginning has yet to be made in Rajasthan, the southern states and in the eastern states. Some work has been initiated in Bihar and Orissa. About three fourths of the total area in the country that can be covered by consolidation remains, therefore, still to be consolidated".⁴

NOTES

1. "It has repeatedly been emphasised that one of the most serious causes of debt is the smallness of the average holding, which is greatly aggravated by the way in which it is split into innumerable fields scattered round the village. It is obviously too late to increase the size of the holding and with an increasing population, they are bound to become even smaller; but there is no reason, except human obstinacy and prejudice why they should not be consolidated. For ten or fifteen years economists and officials debated how it could be done but it was left to Mr. Calvert to hit upon the discovery that cooperation provides the best solution of the most difficult problem. The first society was formed in 1921 and now ten years later there are about 800 with 48000 members and in the interval about 3,36,000 acres have been consolidated at the cost of Rs. 2.50 per acre, the whole of which has been borne by the Government. It must be expected "that whole tracts will be adjusted without great labour and much time but a real revolution of incalculable benefit to the cultivators of the central districts has been definitely started."
- M.L. Darling "The Punjab Peasant in Prosperity and Debt" OUP, 1932, p. 252.
2. M.S. Randhawa— "Green Revolution" *Ibid.* pp. 43-44.
3. D.P. Gupta and K.K. Shangari "Agricultural Development in Punjab"—Agricole Publishing House, New Delhi, 1980. p. 103.
4. K.N. Raj "Decentralisation in Perspective" *Mainstream*, 22 Dec. 1984, New Delhi.

(ii) NEED FOR LAND REFORMS

Soon after the attainment of Independence, the Government of India realised that if agriculture was to be modernised in the country, and new technology spread in all the states for augmentation of agricultural production, land reforms must be introduced and implemented in right earnest. Absentee landlordism, tenancy-at-will and sharecropping could never generate enough enthusiasm for making improvements in traditional agriculture—much less to opt for the Green Revolution technology later on. Experience has since shown that states with peasant proprietor

ships have done far better in making the new technology a success than the states in the eastern part of the country which had been subjected to a "permanent settlement" by the colonial rulers since 1793. In these states a chain of powerful intermediaries had been created to collect rent from the tillers, paying a fixed sum to government annually on a permanent basis. These intermediaries soon become a powerful and rich class of proprietors, bringing in a Zamindari system which culminated in a lazy and irresponsible approach to agriculture.¹

In contrast, in the *ryotwari* system, which prevailed in Madras, Punjab and Bombay, individual owners, responsible severally for payment of land revenue, encouraged and retained their initiative for progress and assertion of their own rights. In result the land records were maintained in good shape, as compared with the chaotic state of affairs in the Zamindari System areas. And they responded to new progressive ideas with courage and confidence.

In 1947 half of India was under the Zamindari System in which 80 per cent of the agricultural land was in the hands of the absentee landlords. Actual cultivation was done by those who did not own the land. No wonder the Congress Party adopted "land to the tiller" as its slogan and battle cry in 1947.² The policy of the Government of India was to provide security of tenure to tenants at will/sub-tenants, reduce excessive rents and regulate them on an equitable basis, besides abolishing the Zamindari system as such. Consolidation of holdings and the prevention of further fragmentation thereof were also a part of that policy. All these objectives were laid down specifically in the plan documents. But the implementation was slow.

The abolition of zamindari was effected without force in accordance with law and with public support. Compensation was paid in the shape of negotiable transferable bonds with 20-40 years maturities. An estimated 20 million tenants of former intermediaries thus entered into direct relationship with the state and became owners of their holdings.

Legislation for tenancy reforms was enacted in all states including laws for rent regulation for security of tenure and for land ceilings on holdings. Surplus land was to be distributed among landless tenants. According to the all India (Agri) Census of 1961, out of 100 cultivators, 76 were owner cultivators, 16 were owner-cum-tenant cultivators and only 8 were pure tenant cultivators. It all looked well on paper but laws were being dodged with impunity, tenants were being forced to give up, ceilings were avoided through the device of benami transfers and partitions, in collusion with the officials. Record of tenants' rights did not exist in many states—nor were these updated where the same existed. It was realised that the success of the new technology in agriculture under the Green Revolution depended to a large extent on effective land reforms. As, however, the benefits of that revolution became known, the landowners, big and small farmers stuck to their position and rights—landowners using pressure as a weapon—creating all round tensions. Voluntary surrenders provided by law are hardly every voluntary: they are usually done under pressure and used as the biggest instrument in depriving the tenants of their due protection. The right of resumption of land by owners for self cultivation was also misused as a measure for land grabbing. Tenancy reforms were not able to regulate rents either.

"One of the principal aims of tenancy reforms was to convert tenants into owners of the land they cultivated. This object of conferring occupancy rights on as large a body of tenants as possible did not materialise because of high rates of compensation to be paid by the tenants."³

No wonder the Fifth Plan document observed that

"the laws for the abolition of intermediary tenures have been implemented fairly efficiently while in the fields of tenancy reform and ceilings on holdings, legislation has fallen short of the desired objectives and implementation of enacted laws has been inadequate."⁴

The slow progress of the land ceilings legislation, especially the implementation of it, deserves special mention. As observed in the Report of the National Commission on Agriculture (1976) "the almost compelling case of land ceiling arises from the absolute and permanent shortage of land in relation to the population dependent on it, the limited prospect of transfer of population to nonagriculture and the need to step up production along with increase in employment." But for 15 years upto 1962 this question of ceilings remained a vague yearning as a part of agrarian reforms—a vague politico-economic concept, justified more on considerations of social justice than on grounds of increasing production on developing agriculture.

Each state enacted its own laws on the subject of ceiling. National guidelines were issued only in 1972. The definitions still varied from state to state—so also the laws and the coverage—all full of loopholes which the landowners exploited to circumvent the law. They resorted to partitioning their holdings through "benami" transactions among their friends and relatives and ultimately very little was left as surplus land for redistribution. Implementation of laws generally also left much to be desired. Penal provisions being minimal, the land ceiling laws were ineffective, in the overall.

In the post 1972 period uniformity was introduced on the basis of a national consensus on the question of ceilings which were made lower, exempted categories cut and measures to control under-hand transfers provided for. Some variations still remained from state to state.

The implementation lag, colossal as it was, did not disappear—mainly due to lack of political will. In *Appendix I* to this chapter, the steps suggested in the Fifth and Sixth five year Plans in regard to land reforms and action thereon have been analysed. Not only there was no link between the state and the peasants and potential beneficiaries through any local popular organs, some states did not even update the record of rights; landowners also nullified the law in many cases by obtaining court verdicts. The political will not asserting itself well or adequately, and the implementation being left merely to the bureaucracy, was most ineffective. The Fifth Plan called for dynamic, clear and firm political direction and suggested that the work be entrusted to a few handpicked officers. This too did not have much effect on the ground.

For modernising agriculture in Indian conditions, the basic of land reforms

would be to break up the strangle-hold of the big landed interests, abolish parasitism on land, and the landlord-tenant nexus, strengthen the overall economic position of the mass of peasantry and create conditions for the development of a healthy and dynamic agrarian society. We have failed in this.

Let us consider here whether a drastic redistribution of land ownership is really a prerequisite to the achievement of increased agricultural production coupled with distributive justice. According to Dantwala "while land reform can help to eliminate some of the worst forms of exploitation, by itself it cannot solve the problem of poverty—Application of the ceiling is a necessary and desirable reform but a drastic lowering of the ceiling is not likely to be very rewarding either for agricultural development or significantly better agrarian relationship. High priority in land reform in the present context should be given to protective legislation, prevention of land acquisition by persons with big money, influence or political power and protection of tenants and sharecroppers against evictions. Land reform *per se* can do little for small farmers."⁵

In an overpopulated country like India, redistribution of land which is in short supply cannot very much help the problem of rural poverty. If a ceiling is placed low on holdings, redistribution would hardly give even one acre each to the landless in many states. Under our conditions, therefore, drastic redistribution of land ownership cannot be a precondition for implementing programmes of growth with equity. But concentration of land in a few hands will have to be avoided and the tiller of land must get the benefit of his efforts. The NCA had recommended an agrarian structure oriented towards peasant proprietorship. Within that, cooperative activities could be promoted by forming functional groups or societies for effective implementation of area-based agricultural activities such as plant-protection, mechanical cultivation, soil conservation and contour bunding etc.

In addition, according to the NCA, all tenants of land owners possessing more than marginal holdings should be vested proprietary rights and declared owners. Share-cropping tenancies with equal sharing of expenses and net returns would be in order also.

When the system of tenancy under a private landowner disappears, agriculture would be a family occupation of a peasant cultivator and not as a source of subsidiary unearned income. Absentee landlordism would disappear though tenancy may have to be allowed for some years in a restricted and strictly regulated form.

Let us state here the obvious, viz. that, in the long run, the organisation of agriculture in India cannot be on a capitalist model nor on the collective farming model—for reasons obvious—but as a peasant-proprietor economy, based on private ownership in land, supplemented by cooperative endeavour in many spheres of activity and production. In this system the immense labour power of self-employed peasantry is fully utilised for agricultural growth. Experience has shown—as in Punjab—that given the necessary conditions, small farmers are no less efficient than large farmers. To strengthen this system the land reforms already enacted must be implemented and future accumulation of land in the hands of the rural rich stopped, requisite inputs, services and facilities provided to the peasant in adequate measure, proper transport

and marketing arrangements made for the sale of their produce at a stable reasonable prices and so on.

As we have seen, the states had enacted requisite legislation at the instance of the Planning Commission and the Central Committee for Land Reforms, but in actual practice, low priority was given to implementation. Now this programme must be carried out with will and vigour in the coming Seventh Five Year Plan—to be treated “as a necessary cleansing operation before the next stage in agrarian change.” To enable the great majority of farmers, including small and marginal ones, to participate in the benefits of new technology in agriculture, steps must be taken speedily to make their holdings, viz., their stake in the land, more viable. It is imperative, therefore, that these land reform measures are adopted with the same priority as the development of irrigation, use of hyv seeds and chemical fertilisers. Community and group action must be developed within a sympathetic environment.

Punjab state believed that the two objectives of land reforms were to increase agricultural production and to give social justice to the tiller of the soil, on the theory that “agricultural production process depended on the rights and obligations of the land holders to the use of land, there being a close relationship between the land system and the efficiency in agricultural production.”⁶

In 1947, the economy of the new state was in shambles; the problem of resettlement of refugees loomed large; land was mostly unirrigated and virtually there was no industry to absorb the surplus labour. After allotment of land there were quite a few intermediaries between the state and the tillers of the soil, tenure was insecure, rents were high and unregulated, holdings were scattered, large portion of the land was with a fewer number of owners and majority were either landless or held uneconomic holdings. In result the production was small and yield levels were low.

The land reform legislation in the Punjab therefore, consisted of the following Acts :

East Punjab Utilisation of Land Act, 1949

The Punjab Occupancy Tenants (Vesting of Proprietary Rights Act, 1952).

The Punjab Abolition of Ala Malkiat and Talukdari Rights Act, 1953.

The Punjab Security of Land Tenures Act, 1953.

The Pepsu Abolition of Biswedari Ordinance, 2006 Bk.

The Pepsu Tenancy and Agricultural Lands Act, 1955.

The laws abolished intermediaries, occupancy tenants were made right owners, ceilings on land holdings were imposed. Surplus lands thus declared were distributed among tenants. As a result of these measures

“the area cultivated by owners increased from 51.4 per cent of the total in 1947 to 66.4 per cent in 1957 and 80.89 per cent in 1969-70. Area cultivated by tenants on the other hand decreased from 47.2 per cent in 1947 to 32.5 per cent in 1957 and 19.11 per cent in 1969-70. Area operated by occupancy tenants declined from 9.9 per cent to 4.6 per cent in 1957 and to zero by the end of the fifties, mainly because 6,47,740 occupancy tenants had acquired proprietary

rights over an area of 18,50,489 acres. As a result Punjab emerged as a land of peasant proprietors.”⁷

Dr. Randhawa believed that

“A stable and restructured rural base with an equitable tenurial system paved the way to Green Revolution and can be accredited with its blooming to the present stage. It created a highly responsive agricultural and rural society which had capacity and was willing to adopt and absorb the elements of improved agricultural technology.”⁸

But he added also that efforts to lower (below 30 standard acres) the land holding ceiling could be counter productive on the ground that distribution of productive assets (land in this case) should not after all be considered the only and universal solution to all the problems of a society and if redistribution assumes the shape of a process of atomisation of land holdings, there will be little scope for the introduction of elements of modernisation and improved production technology. Contrary views could, however, be held equally strongly on this controversial matter.

Here is another view supporting Dr. Randhawa's contention but on other grounds :

“In a way we do not need to redistribute land and broaden the base of land ownership for modernisation of agriculture because hyv seeds have universal application. The factor responsible for differential spread of hyv seeds among regions and states is the uneven development of water resources rather than tenurial arrangements. Most impressive spread of hyv has occurred in Punjab, Haryana, Tamil Nadu and Western UP—by no means known for successful land reform legislation or its implementation—compared with the slow speed in Gujarat and Maharashtra which have a better record in respect of land reforms.”⁹

Land Reforms have many meanings. But if we confine them to only imposition of a ceiling on land holdings and subsequent distribution of surplus land to the landless, then such a programme properly implemented could reduce inequalities in the countryside since the land is unevenly distributed and more than 8m. households (1960-61) are landless in India. Economically such a step may be less desirable but politically it would be very attractive. But for the success of Green Revolution and largescale mechanisation and avoidance of eviction of tenants, the corrective measure most appropriate would happen to be not land redistribution but protective legislation to provide protection to tenants and sharecroppers. (Dantwala)

Impact of New Technology on Land Tenure System in Punjab

- (i) The land ownership system now dominated Punjab agriculture and there was no serious problem of tenancy;

- (ii) The small farmers had leased in more land than they leased out, to make their unit of cultivation atleast more viable;
- (iii) finding the intensive use of modern technological inputs profitable, land owners started sharing the cost of new seeds, fertilisers and irrigation charges with the tenants;
- (iv) with new farm technology farm mechanisation had resulted in increased employment of human labour owing to the increase in cropping intensity. In other words mechanisation did not replace human but bullock labour;
- (v) farm wages were rising fast in Punjab. This pressure compelled the farmers to adopt mechanisation in harvesting and threshing of crops.

At *Appendix II* are placed some extracts from the writings of late Wolf Ladejinsky, a world famous expert and a lucid, sympathetic and perceptive observer of land reforms in India.

NOTES

1. According to Sudhir Sen, "Most rice growing areas of India are heavily landlord ridden, with a high proportion of exploited tenants-at-will sharecroppers who lack both the will and the means to exploit the new miracle seeds."
"Reaping the Green Revolution"—Tata Macgraw Hill, 1975—P12.
2. Sudhir Sen—"Reaping the Green Revolution"—Tata Mcgraw Hill—New Delhi 1974—P 192.
3. Report of the Commission on Agriculture (1976) Abridged : P. 681.
4. Report of the Commission on Agriculture (1976) Abridged : P. 678.
5. M.L. Dantwala—Preface to Agricultural Development PP. 26,29.
6. M.S. Randhawa—Green Revolution, *Ibid*, 1974. P. 45
7. M.S. Randhawa—Green Revolution *Ibid* 1974—P 47.
8. M.S. Randhawa—Green Revolution *Ibid*—P 47-48
9. Bandhu Das Sen—"Green Revolution in India—a Perspective", Wiley Eastern Private Ltd. New Delhi, 1974. Pp. 81-82

APPENDIX I (Page 55 refers)

Analysing the steps suggested in the Fifth and Sixth Five Year Plans in regard to Land Reforms

Objectives (as stated in the 5th Plan)

- (i) to remove such motivational and other impediments to the increase in

agricultural production as arise from the agrarian structure inherited from the past;

- (ii) to eliminate all elements of exploitation and social injustice within the agrarian system so as to ensure equality of tenure status and opportunity to all sections of the rural population; to be achieved by

- (a) abolishing all intermediary interests between State and the tiller of the soil;
- (b) regulating rent;
- (c) conferring on tenants security of tenure, eventually ownership rights;
- (d) imposing ceiling on agricultural holdings;
- (e) distributing surplus land among small holders and landless agricultural labourers;
- (f) bringing about consolidation of holdings;
- (g) compilation and updating of land records.

Green Revolution had led the noncultivating owners to eject tenants and to cultivate land directly. The tenant could not make big investments to modernise agriculture unless he was sure of his tenure. Hence the need for land reforms, inter alia.

Progress

- (i) As a result of the abolition of intermediaries about 20 m. tenants have come into direct contact with the states. Compensation due was Rs. 670 crores, partly paid.
- (ii) Share of crop $\frac{1}{3}$, $\frac{1}{4}$ or $\frac{1}{5}$ of gross crop—several states have enacted laws for conferring security of tenure on tenants but the position of share croppers continues to be insecure in Bihar, TN and AP particularly. Provisions have been made in several states for enabling tenants to secure ownership rights; the same were yet to be made in Bihar and TN.
- (iii) In the matter of ceiling on holdings there was evasion because of exemptions under the law, mala fide transfers and partitions, by collusion or otherwise and from implementation of laws. National guidelines were issued in 1972 after a Chief Ministers' Conference.
- (iv) Regarding consolidation, there were no laws yet (1974-75) in AP, Kerala, TN; Gujrat, MP, and West Bengal had passed laws for voluntary consolidation. By 1972, about 32.6 mha had been consolidated. Progress was uneven. Only in Punjab, Haryana and western U.P., the job had been completed.

By the beginning of Sixth Plan (1979-80) nearly 45 mha of land i.e. about $\frac{1}{4}$ of the total had been consolidated. Implementation had been extremely patchy and sporadic. Even a beginning had not been made in the southern states and Rajasthan. In the eastern states some work had been started in Bihar and Orissa.

Operational Programmes

Laws were needed for preparation and maintenance of tenancy and ownership records. Record of rights needed to be upgraded quickly for the sake of share croppers' rights particularly. There was need for cadastral survey of tribal areas. Surplus land was to be distributed quickly so that provision of inputs for cultivation could be arranged in time.

Updating of land records was necessary not only for implementation of land reforms but also for access to agricultural credit which relied heavily on title to land. This work was taken up all over the country in the Sixth Plan but a lot of ground still needed to be covered, especially in the eastern region.

Administrative Machinery

The Fifth Plan even suggested the setting up of land reforms commissioners at state level and the district land reforms officers with sufficient status. Separate organisation was to be set up at field levels. Civil Courts were not to be involved in land reforms cases; these were to be entrusted to special Land Reforms Tribunals, purely administrative following simpler procedures.

Committees of beneficiaries were to be associated with the implementation of land reforms at block and village levels to advise on all connected matters. Committees of sharecroppers, landless labourers and of those owning less than two acres were to be formed.

Sixth Plan even suggested the chalking out of a time-bound programme for various stages of land reforms legislation and implementation. It considered that

"Land Reforms policy is a comprehensive one and has been nationally accepted. Faulty implementation leads to slow progress. Often the necessary determination has been lacking to effectively undertake action especially in matters of ceiling laws, consolidation of holdings and in not vigorously pursuing concealed tenancies."¹

NOTE

1. Fifth Plan Documents Govt. of India, Vol. II, P 42 Sixth Plan Documents, Govt of India, 1980-85.

APPENDIX II (Page 59 refers)

Below are reproduced some extracts from Wolf Ladejinsky's paper called "Agrarian Reform in India—1965". Before the extracts are quoted, it would be useful to describe the Indian setting, as he saw it then :—

"Many people are on too little land;
 Scarce land yet concentrated in a relatively few hands;
 Negligible capital invested in each unit of land and generally underemployed
 land;
 Inadequate irrigation facilities and dependence on mercy of nature;
 Low yields but high rents;
 Poor farmers but expensive farms;

Small holdings getting smaller, under the rising pressure of population, with no alternative occupations;

Inadequate tools, indebtedness and usury, malnutrition and illiteracy and absence of agricultural ladder. Probably 3/5 of the cultivating families have little or no margin for innovation and risk taking and this explains the prevalence of subsistence farming with its lack of dynamics or regenerating capacity."¹

Extracts

1. "Above all the emphasis is on the fact that the Indian tenurial system is one of the elements that inhibit agricultural productivity." (p. 369)

2. "In India where land is scarce prime resource and pressure on the land continues to mount, the farmers' rights in land are an issue of transcendent importance."

3. "Agrarian reforms in India to be truly beneficial must include the following elements :—

favourable financial arrangements for land purchases, better methods of cultivation through technical assistance, land consolidation of fragmented holdings, adequate credit, cooperative marketing facilities, farm price schemes to stimulate agricultural production." (p. 369)

4. "As components of land reforms in India, proprietorship and security of tenure are on top of the list. Security includes fixity of tenure, fair rentals and compensation for improvements made by the tenant—The sharing of the cost of inputs by owner and tenant is thought to be a vital part of a sound tenancy agreement—The rentals in India are high. Really it should be a fixed monetary rent, as part of security of tenure. Disputes between landlord and tenants should be settled by arbitration. There should be a written agreement between the two—always" p. 370

5. "Land reforms through legislation mean redistribution of income, political power and social status. So long as legislative bodies are dominated by land-propertied classes enforcement of such legislation will not be easy."

It may be concluded that land reform has not only powerful economic implications but commences essentially as a political question running head-on into a fundamental conflict of interest between the 'haves' and 'havenots' " p. 371

6. "Consolidation of fragmented holdings—when fragmentation affects so

adversely all the cultivators of India, including tenants, it becomes a legitimate subject of land reform in its broad sense. Most operating holdings in India are small but the difficulty of working them is greatly accentuated by their fragmentation to a point that in the experience of the farmer "the earth is crumbling under our feet" (p. 373)

7. The First Five Year Plan prescribed the following goals of policy.

- (i) "security of tenure subject to the right of an owner to resume limited acreage for self cultivation;
- (ii) reduction of rents;
- (iii) conversion of non-resumable land under tenants into ownership;
- (iv) ceiling on land ownership so that excess land can be redistributed. Eviction of tenants had to be avoided as far as possible; rents were not to exceed $1/5$ or $1/4$ of the crop." (p. 377)

8. "Poor or total lack of enforcement of land reform laws (especially ceilings laws) is due to the superior position of the land owner, inferior social and economic status of the tenant in the village, complexity of laws beyond the comprehension of the villager. Sometimes the faulty nature of the legislation itself considerably nullified the effect of the land reform. The right to resume land for self-cultivation was particularly misused. This weakened the main goal of security of tenure and has made the enforcement of reduced rents impossible."

"The right of the tenant to buy land from the owner does not work in practice because the landlord dictates the price and the price cannot be fixed mutually. The tenant is at a disadvantage. The land must be acquired and resold to the tenant." (p. 379-80)

9. "The extreme maldistribution of land in India, with nearly a quarter of the rural households owning no land at all, and another $1/5$ owning less than 1 acre each, provides ample social and economic reasons for the use of the ceiling as a means of reducing the imbalance——The problem touches the private property rights and is no doubt a ticklish issue——Owners in anticipation of the law divide up their holdings among family members and relations to avoid the ceiling. Nothing much became surplus for redistribution. Law did not contain the "teeth" to prevent such transfers." (p. 382)

10. "The land reforms in India are not the result of popular demand but rather the brain child of the intellectuals of the Congress Party. This is not a criticism of external intervention; on the contrary such interventions are indispensable catalysts of a reform movement.

The peasants suffering from lack of political and social consciousness remained quiet more or less and the Congress party did not stir them up into an agitation or even active participation." (p. 383)

11. "Only an organised peasantry, conscious of its strength and capable of telling the seekers after their vote that, 'we support those who support us', could at least in part effect the changes which have so far eluded them. Barring that, one of the important preconditions for improved agricultural production in a large acreage

of the cultivated land of India, as well as one of the important preconditions for a greater degree of social and political equality, will be long in coming." (p. 393)

12. "Agricultural labour poses grave economic and social problems. Their number and its continuous rise makes any amelioration effort very difficult to carry out. These households cannot generally make both ends meet and are in chronic debt. Their number must be over 10 crores "

13. "Aside from India's long range and basic problems of high rate of population growth, the answer to the problem of agricultural labour lies on the extent of agricultural development—as a major source of village employment and on the demand for rural labour generated by the country's industrial and commercial expansion." (p. 384)

14. "Dr Khusro and Dr. VKRV Rao have demonstrated that for a long time to come, relief to the underemployed agricultural labour can come only from greater development of agriculture itself, the emphasis being on labour absorbing rather than labour displacing techniques." (p. 386)

15. "The law should be so framed that the tenant pays the controlled rent to the Government and the latter reimburses the landlord accordingly." (p. 396)

16. "It is recommended that the state government buys the nonresumable land directly from the landowners for resale to the tenants."

17. "Without a written (basic) record of tenancies and all provisions relating to security of tenure cannot be enforced." (p. 397)

18. "A committee should be set up in every village made up of two tenants, one part owner tenant, one owner cultivator and landlord to help the patwari and the revenue officials to prepare the record of rights." (p. 397-398)

Selected papers of Wolf Ladejinsky "Agrarian Reforms-an Unfinished Business" OUP for World Bank, 1971, Page 371. The above extracts are from that book.

(iii) HIGH YIELDING SEED VARIETIES—THEIR SUPPLY

The high yielding variety seeds are a major input of agricultural production under the Green Revolution technology. Their main characteristic is increased responsiveness to chemical fertilisers. Their period of maturing is short: it helps double cropping; their short stems can easily carry a heavy fertiliser load, resist wind damage; their larger leaf surface helps the process of photosynthesis.

As stated earlier, the Mexican wheat varieties introduced in India in the early 60's were Lermaerojo and Sonora; PV-18, S-306 and K-68 were locally improved Mexican varieties. Their yields were much more than those of improved traditional wheat varieties because of their larger fertiliser-absorption capacity and rust-resistance quality. With further extensive research four new varieties were evolved viz., Kalyan Sona, Sonalike, Safed Lerma and Chhoti Lerma. Then came Sharbati Sonora, 'gold amber' in colour, in keeping with the Indian taste—with more varieties to follow. All touch a yield of 3 tonne/ha, if not more.

Development of hybrid rice seed was much slower. First came the Taiwan varieties like Taichung Native 1 (TN 1) but it was highly susceptible to disease and

insects. IR8, developed by the IRRI at Manila, took its place from 1969-70 onwards and covered major portion of the area under rice. Local dwarf varieties of rice were also evolved later, like ADT 27, Jaya and Padma etc. Area coverage by hyv rice had touched over 50 per cent by 1982-83 but the north-eastern states were lagging behind particularly. The most advanced states in switching over to new varieties were Punjab, Haryana, TN and AP where seed, water and fertiliser combination started yielding big crops.

In the case of hyv seeds, their availability, timeliness, cost and quality are very important factors. In the earlier years the National Seeds Corporation was the main supplier; it produced seeds through public and privately-owned seed multiplier firms and sold through cooperatives and block agencies. Later, as demand increased, certified seed farmers—big farmers—were asked to produce them and sell the same through private dealers but under supervision. The natural spread of these seeds also followed at the same time. But quality suffered in the process, particularly after the private farmers entered this trade. Adulteration became common, seeds were not properly treated before sale, machinery for certification of seed was inadequate, even careless. This situation brought a bad name to the seeds itself and obstructed their spread. The farmers hesitated to make investments when the quality of seed became doubtful; they would rather rely on local improved varieties which were more easily available and the performance of which in the field had been established since long.

The hyv seeds yield best results if these are properly produced, certified and safeguarded and the use of pesticides and weedicides runs parallel with them. A great responsibility devolves on the administrative (government) agencies to ensure that the seeds of proper quality are made available to the farmers in time, in proper quantities and at reasonable prices. So also the pesticides and weedicides.

The Government of India has now been fully geared up to deliver these seeds adequately and in time; an efficient infrastructure has been set up for the purpose. In 1984-85 distribution of a record quantity of 35 lakh quintals of cereals hyv seeds was made; there was a record production of breeder, foundation and certified seeds in that year; a Seed (Control) Order to ensure quality and equitable distribution of seeds was promulgated and lastly an advance supply plan of seeds for each season was introduced from that year. To ensure this, advance planning for organising the production and distribution of various varieties of seeds is absolutely essential and various agencies identified to undertake the responsibility for various stages of seed multiplication after the necessary planting material is supplied to them.

Breeder seed production is now done by the National Seeds Corporation and the State Farms Corporation. About 23,600 Q were produced in 1983-84. Foundation seed—the intermediary stage between the breeder and certified seeds—was produced to the extent of 4.70 lakh Q. in that year. Certified seeds were also multiplied similarly and 57 lakh Q. were distributed in that year (all crops). The supply in the year 1979-80 was only 14 lakh Q.

The importance of strengthening the infrastructure for seed production and distribution was recognised by the Government of India in the mid 70's and a National Seeds Programme was launched in 1977 in collaboration with the World

Bank, covering 9 states of Punjab, Haryana, UP, Bihar, Orissa, Maharashtra, Karnataka, AP and Rajasthan. Major components of this programme were (i) strengthening of breeder and foundation seeds production in agricultural universities and ICAR Institutions (ii) farm development (iii) setting up of seed processing plants, (iv) strengthening of seed testing laboratories and seed certification agencies; (v) setting up of seed godowns. These activities are not all centralised with the National Seeds Corporation; states have their due share of each through their own State Seeds Corporations.

"The hyv seeds are land substituting but land using materials neutral to scale because they can be used by all regardless of farm size. They require entirely new inputs and agronomic practices including use of irrigation water, fertilisers and pesticides. They play the role of modernisers of agriculture like engines of change, capable of transforming a traditional farmer into a commercial producer. According to an observer, they act the part of a 'steam engine' (for industrial revolution) to ignite an agrarian revolution in poor countries."¹

The hyv seeds appeared on the Asian scene at a time when the Malthusian spectre of famine and hunger seemed to loom large on the horizon and it appeared that the less developed countries were fast losing the capacity to feed themselves. These miracle 'seeds' belied the fears of the Paddock Brothers (William and Paul) who had predicted a famine in 1975 in these countries.²

These seeds were widely acclaimed as the "Cornucopia" that would ensure an abundant supply of food. Some of the welcome attributes of hyv seeds were divisibility, scale neutrality and labour intensity. They did set the ball of progress in motion, providing a base for further development of agriculture and requiring further investments in irrigation and production of complementary inputs.

TABLE 9
Area planted to hyv seeds in India

Grain	1967-68		1971-72		1980-81		1981-82	
	under hyv	% of total area	under hyv	% of total area	under hyv	% of total area	under hyv	% of total area
Wheat	2,942	19.6	7,489	39.1	17,390	78.02	17660	100.0
Rice	1,785	4.9	7,215	19.3	18,490	46.0	19330	47.4
Jowar	603	3.3	913	5.4	4,180	26.5	4110	25.3
Bajra	419	3.3	1,832	15.6	3,800	—	—	—
Maize	287	5.1	489	8.7	1,390	—	—	—
Total	6,036	5.0	17,938	14.7	45,290			

Sources :— (i) Economic Survey, 1981-82.

(ii) Hanumantha Rao, "Technological change & Distribution of Gains in Indian Agriculture", Macmillan 1980, P 10

As in life itself, seed is the starting point in modern agriculture also. Anything going wrong with the outcome is ascribed to the seed, in the first instance See extract below :-

"The introduction of any important new technology into a society invariably tests that society's responsiveness to change as well as the effectiveness of its social and economic systems. That heightened social tensions and widened income disparities have sometimes accompanied the introduction of the new seeds is not surprising. It is important to keep in mind, however, that the high yielding crop varieties did not create the political, social and economic institutions that produce such tensions and disparities. Rather their productive potential has, in many cases, brought into sharp focus the critical importance of long needed institutional reforms. The new seeds do not provide a technological panacea that can alone eliminate hunger and unemployment. They do represent a land-mark technological advance that can, if properly used, measurably improve the basic welfare of a sizable segment of mankind."

NOTES

1. Bandhu Das Sen—"Green Revolution in India—a Perspective" Wiley Eastern Private Ltd. New Delhi, 1974 Chapter.
2. Paddock William & Paul—"Famine 1975". Weidenfield & NICHOLSON, LONDON, 1965.
3. Lester Brown and Erik Eckholm of World Watch Institute USA in their book "By Bread Alone," Praeger Publishers 1974-Quoted in "Food for People, Not For Profit," Edited by Catherine Lerza and Michael Jacobson, Ballantine Books, New York p. 269.

(iv) IRRIGATION

The potential, availability and utilisation

Water is a major input in agricultural production—more so under modern technology provided it is available systematically and on required basis. It not only adds to production—it also ensures stability in production.

Irrigation has to be expanded to the utmost to meet the increased requirements of agricultural production under the Green Revolution strategy—the rainfall being confined only to 3 to 4 months in a year. For this purpose, water resources have to be harnessed fully and managed and utilised more efficiently. The assessment made by the NCA (National Commission on Agriculture) (1972-74) shows that "the total annual basic water resources of the country are 185 mham¹, including 50 mham of ground water and 135 mham of surface water. On full development

the total annual basic ground water resources would increase to 85 mham and surface water to 185 mham, including 45 regenerated from ground water." The utilisable flows are about 105 mham—70 surface and 35 ground water.²

Net sown area of the country is expected to rise from 140 mha in 1970-71 to 250 mha in 2000 AD and the total cropped area from 165 mha to 200 mha in the same years. Taking all relevant factors into consideration, the ultimate irrigation potential is broadly assessed at 113 mha—73 from surface sources and 40 from ground water.

Current irrigation potential estimated by the Irrigation Ministry of the Government of India, in its Annual Report 1984-85, is as follows :-

	ultimate	created upto 79-80	(in mha) VI Plan target	Achievement by 1984-85
Major and medium	58	26.5	5.7	30.85
Minor (surface)	15	8.0	1.01	9.04
Minor (ground water)	40	22.0	7.01	27.97
Total	113	56.5	13.7	67.86

Prior to 1951 total irrigated area (gross) was 22.6 mha only—which increased to 42.3 mha by 1973-74, to 56.5 mha by end 1979-80 and then to 63.3 mha by the end of 1983.³

According to the 141st Report of the Public Accounts Committee 1982-83 (P 46) on the Planning Process and Monitoring Mechanism with regard to Irrigation Projects", the country had a total irrigation potential of 22.67 mha (9.7 under major and medium and 12.9 under minor Irrigation) at the commencement of the First Five Year Plan (1950-51). During 1951-1982 Rs. 16,047 crores were invested on the development of irrigation facilities in the country. The cumulative target for the creation of irrigation potential during this period was 59.57 mha (29.10 under major and medium and 30.47 under minor irrigation). Achievement till April 1983 was 61.58 mha. According to the Irrigation Ministry's Annual Report of 1983-84 :-

"upto the end of 1979-80, a gross potential of 56.5 mha was created through irrigation projects—the total utilisation was 52.3 mha, leaving a gap of 4.2 mha between the potential created and its utilisation."

According to the P.A.C. Report above cited, there had been a time and cost overrun in all the major and medium projects. As many as 32 of them had shown cost overrun of 500 per cent or more. Not a single project had been completed within the anticipated cost and time schedule. This explains the following remarks in the country's Economic Survey for the year 1982-83 :-

"the cost of providing irrigation has increased at constant (1970-71) prices from

Rs. 2770/- per ha in the first plan to Rs. 5580/- in 1979-80 and it is expected to go upto nearly Rs. 7000/- as per 6th plan projects."

Regarding the progress of providing irrigation facilities in India in the recent couple of decades, the conclusion reached by the Public Accounts Committee in their 141st Report dated April, 1983 are summed up below :-

"(i) Out of a total irrigation potential of 113 mha, the achievement so far is 61.58 mha—only 55 per cent of the tapped potential. At Independence the potential was only 22.6 mha ; 39 mha has been added in 32 years of planning. Growth rate of a little over 1 mha per annum must be stepped up to 2.5 to 3 mha per annum, to be able to achieve the full potential by the turn of the century. A big task;

(ii) To achieve this, larger plan allocations are needed; (iii) There have been very heavy time and cost overruns in implementation. Eight of the major projects of Irrigation have gone on for 15-20 years and as many as 32 major projects have shown cost overruns of 500 per cent or more. Not a single project has been completed within the anticipated cost and time schedule :

(iv) There is a considerable lag in the utilisation of created potential both in regard to major and medium projects and the minor irrigation schemes."

The Irrigation potential already created, however, is not being effectively utilised because

- (i) required channels and subchannels have not been built in all cases and water is not reaching the fields;
- (ii) seepage losses enroute are colossal. Water wastage can be avoided by lining of canals and distributaries;
- (iii) land holdings have not been properly levelled or aligned to facilitate gravitational flow of irrigation—and drainage;
- (iv) consolidation of holdings has not taken place in most of the states.

(Political consideration, perhaps, have outweighed the production considerations in our approaches to land reforms of which consolidation of holdings is a vital aspect)

According to the Central Irrigation Ministry, the effective utilisation of irrigation potential already created involves development of land in the command areas by way of land shaping, land levelling, construction of field channels and related extension works. The programme of C.A.D. (Command Areas Development) is on in 102 projects.⁴

In spite of the fact that Irrigation water is so vital for India's agriculture, especially in the Green Revolution context, and irrigation potential has been created at such a high cost, the utilisation of it is generally poor. Given the limited opportunities for bringing additional acreage of fallow lands under cultivation in future, this irrigation is capable of playing a useful land-augmenting role in India's eco-

onomy. And irrigation is a precondition [for the successful introduction of the hyv seeds even in areas known for heavy rainfall. In the delta areas of the South where hyv rice can be grown best in Rabi (winter) period, irrigation water supply is very necessary. This 'miracle rice' does not do well in heavy rainfall standing water. Being of a shorter maturing period its harvesting becomes difficult under heavy rain.

Without going into further details of this vital input—irrigation water—for our agriculture, it can be safely asserted that there is considerable scope both for increasing the total area under irrigation and for a more efficient and less wasteful system of water distribution viz., for a proper utilisation of our water potential. Let Dr. Venkateswarlu of IRRI Manila speak about water usage :-

Water Usage

"On one hand 60-70 per cent of the land is handicapped for dependable water resources and on the other, we are not properly utilising the remaining 30-40 per cent so as to improve our production. Even the big national irrigation projects are inadequately utilising the available water resources. As per the calculations known, 30 per cent of water is only retained and used for irrigation and drinking purposes while the remaining 60-70 per cent is flowing waste to join the Bay of Bengal. Even in the irrigation project areas appropriate planning is not made for the benefit of increasing productivity in crops enterprises. The reservoirs and the other measures to retain water are such that it offers little scope to utilise water during premonsoon period. Consequently sowings and plantings largely depend on the arrival of the monsoon which reflects on total production. Secondly irrigation feeder channels are not connected direct to the fields; rather water moves from field to field in 60-70 per cent of the cases—this is highly harmful for using different agrochemicals effectively.

"In advanced countries like Japan, Korea and China, irrigation system is well organised and drainage systematised—both systems operating on *push button* technology; our situation is that delivery and drainage systems operate through same channels and irrigation hardly reaches the individual holdings except in the north western states including UP--Modern technology concerning water use such as time, stage and quantum, and agro-chemical-based usage are all in a crisis as water flow is not under control——Modern technology, modern concepts and water use efficiency are only now being popularised and moving at a slow rate and at the present level of spread it may take more time to expect possible returns from such unirrigated field crops".⁵

The Watercourse Problem

Major and medium irrigation projects, where water for irrigation is distributed centrally by the Department, present difficulties which add to the gap between the potential created and its utilisation. This gap was widening in the 70's; returns were lower in financial terms and the production yields were also less.

The biggest bone of contention has been the construction of water courses

which theoretically have to be built jointly by the farmer beneficiaries at their cost. The lead farmers who receive water earliest in the project claim the advantage permanently on the doctrine of prior appropriation (for years in many cases) and want to keep on using that water. The tailenders hesitate to build watercourses because of the doubtful nature of the share of water, the lead farmers being generally more well-to-do, wielding a political clout also. No farmer will invest his time and money in a watercourse unless he is sure of getting his share of water from it regularly. Thinking that, perhaps, the tailenders did not build watercourses for financial stringency, the Government undertook to take the water upto 8 ha blocks against the previous limit of 40 ha or so. It also embarked upon 60 command area development schemes (now 102) containing a package of other agriculture-related facilities to farmers. The overall problem still remained. What needed to be gone into was the policy for the distribution of water, changes in which had become more pressing because the weak farmers at the tail end had become more vocal in claiming their rights. Inherent drawback in the system originated from the fact that irrigation was developed in the upper reaches of the water distribution system, the lower reaches getting less water though paying water charges in full. The introduction of high-yielding varieties of rice and wheat added yet another dimension to the problem of management of public canals. Everyone wanted more water, more frequently and on time and wanted it vehemently.

By Government's persuasion there was a swing in favour of 'warabandi' system prevalent in Punjab and Haryana states and working very well. It is based on the twin principle of first inducing a scarcity and then equitably distributing in a fool-proof manner only a rationed quantity of water. "Scarcity helps in controlling the problems of salinity and waterlogging and encourages conjunctive use of ground water."⁶ Rationing of irrigation water is enforced by fixing a weekly quota of water for every unit of land and supplying it on a regulated manner on a fixed day and time of the week. This model was suggested in the Sixth Plan and many states have started experimenting with the 'warabandi' pattern, with results varying from state to state.

The assessment of water charges on the basis of production, acceptable in theory, has chances of corruption at lower levels, much to the harassment of the farmers. A system of charging by volume of water consumed is fair and more scientific but this is not possible in practice when the holdings are so small-average being not even 2 ha. Volumetric assessment of water did not succeed-it was tried on the Ganges canal and Lower-Bari Doab canal now in Pakistan. Later it did not work in Maharashtra and Gujarat also.⁷

Currently, experiments are being made on "warimetric" method in Haryana. Assessment is on the basis of number of times a farmer received his fixed and known quantity of water. "The problem of assessment got reduced to fixing the price of water flowing in every water course for a unit time." This is a proxy for volumetric method with none of its disadvantages. Started in 1976 it now covers 20000 ha area. World Bank has accepted these experiments for financial aid and for further research.

Any change in the existing system will attract inertia and opposition which

can, however, be softened by legislative support and enlightened public opinion. The question of rationing water from public canals, in some form or the other, is of paramount importance and shall have to be faced sooner or later. A fool proof method must be evolved for an equitable distribution of this coveted commodity. Such a method will further help in making a success of the green revolution.

Ground Water Development

Groundwater development which provides the bulk of the minor irrigation facility is essentially a people's programme implemented through individual/cooperative effort, with loans from institutional sources. It is widely distributed and provides an instant and reliable source of irrigation to the cultivators.

The extent of ground water resources varies from state to state. The Central Groundwater Board is the national apex organisation vested with the responsibilities of all India survey, exploration, development management and regulation of ground water resource of the country. Set up in 1954 and restructured in 1972 with the merger of the groundwater wing of the Geological Survey of India, the Board has been playing a vital role in undertaking hydrogeological surveys and groundwater exploration studies, monitoring the resources at the national level, assisting the states in groundwater development and management schemes, research development and training of inservice officers of its own, of other central agencies and state governments.⁸

Apart from a systematic regional hydrogeological surveys (having covered 18.845 lakh sq. km out of a total 32 lakh sq km by end March 1984), the Central Board carries out reappraisal hydrogeological surveys also, to assess the changes in groundwater regime regarding quality and quantity in time/space and, subject to utilisation, to take remedial measures in time if the level falls.

The Central Board and the State Groundwater Organisations have collected voluminous data on various groundwater parameters all on a uniform basis. The Board has issued reports on the groundwater conditions of all the states. It also prepares atlases containing information on various parameters relating to groundwater, in respect of each state.

The work of the Central Board in regard to surveys and related studies in the field is being undertaken at the macrolevel also and reports on the district as the smallest unit are being brought out. For purposes of implementation of the programme of development, the state government organisations are required to carry out microlevel surveys. The Board assists the state organisations in every respect, technical, financial and organisational.

As observed already, the extent of groundwater is different in different states. According to the Central Board, the total utilisable ground-water in the country, on full development of surface water resources and adoption of measures for increased infiltration, is of the order of 42.286 mham/year. The chart on next page gives the statewise availability of this replenishable water resource potential of the country statewise and the connected information :

TABLE 10
Ground Water Resource Potential (Volumetric) in the States
and Union Territories of India

<i>State/Union Territories</i>	<i>Utilisable Resource mham/yr.</i>	<i>Net Draft mham/yr.</i>	<i>Potential available for future development mham/yr.</i>	<i>Stage of ground water development in % (as on date)</i>
1	2	3	4	5
1. Andhra Pradesh	3.66	0.74	2.92	20
2. Assam	1.65	0.02	1.63	1
3. Bihar	2.86	0.59	2.27	21
4. Gujarat	2.03	0.69	1.34	34
5. Haryana	0.88	0.61	0.27	70
6. Himachal Pradesh	0.067	0.016	0.051	24
7. Jammu & Kashmir	0.189	0.01	0.179	5
8. Karnataka	1.30	0.18	1.12	15
9. Kerala	0.69	0.09	0.68	13
10. Madhya Pradesh	5.95	0.49	5.46	8
11. Maharashtra	3.45	0.66	2.80	12
12. Manipur	0.008	Neg.	0.008	21
13. Meghalaya	0.028	0.001	0.027	3
14. Nagaland	0.003	Neg.	0.003	21
15. Orissa	2.15	0.09	2.06	4
16. Punjab	1.31	0.95	0.36	73
17. Rajasthan	1.83	0.46	1.37	25
18. Tamil Nadu	2.69	0.99	1.70	37
19. Tripura	0.059	0.001	0.058	1
20. Uttar Pradesh	9.27	2.68	6.59	29
21. West Bengal	1.64	0.49	1.15	30
22. Sikkim	—	—	—	—
Total :	41.714	9.748	31.966	20.4

	1	2	3	4	5
1. Andaman & Nicobar	—	—	—	—	—
2. Arunachal Pradesh	0.113	Neg.	0.113	1	
3. Chandigarh	0.003	0.001	0.002	116	
4. Dadra Nagar Haveli	0.603	0.001	0.002	33	
5. Delhi	0.268	0.237	0.031	88	
6. Goa	0.185	0.017	0.168	9	
7. Lakshdweep	—	—	—	—	
8. Mizoram	—	—	—	—	
9. Pondicherry	—	—	—	—	
Total :	0.572	0.256	0.316	43.7	
GRAND TOTAL :	42.286	10.004	32.282	23.73	

Note : The figures given above have been reconciled with all the States except Gujarat, Rajasthan and Orissa.

Abbreviation : mham/yr=million hectare metres/yr.

Source : Annual Report Ministry of Irrigation, Government of India, 1984-85 page 72.

This chart give the statewise availability of the replenishable water resource-potential of the country, its present level of utilisation and balance available for future development.

TABLE 11
Irrigation Potential of India (Cumulative levels)

		(In Mha)					
	Ultimate feasible	1950-51	1960-61	1968-69	1973-74	1977-78	1979-80
1. Major/Medium irrigation	58	9.70	14.30	18.10	20.70	24.77	27.02
2. Minor Irrigation							
(a) Surface water	15	6.40	6.45	6.50	7.00	7.50	8.00
(b) Ground water	40	6.50	8.30	12.50	16.50	19.80	22.00
Total Minor Irrigation	55	12.90	14.75	19.00	23.50	27.30	30.00
3. Total Irrigation	113	21.60	29.05	37.10	44.20	52.07	57.02

According to the National Commission on Agriculture, Abridged Report 1976, the amount of usable ground water in the country, on full development of surface water resources and adoption of measures for increased infiltration, may be of the order of 35 mham of which 26 may be available for irrigation. (This information seems to be out of date, however).

The progressive actual and likely achievement under major and minor irrigation, in terms of potential gross irrigation, is given in Table 11 prepage and 12 below :

TABLE 12

Total Irrigation Potential and Achievement-Statewise
(for Million Hectare)

<i>Utilisation State</i>	<i>Ultimate Irrigation Potential</i>			<i>Potential</i>		
	<i>Minor</i>	<i>Major & medium</i>	<i>Total</i>	<i>Created upto 1982-83</i>	<i>Remaining to be created</i>	<i>% Potential created</i>
Andhra P	4.2	5.0	9.2	5.3	3.9	57.6
Assam	1.7	1.0	2.7	0.5	2.2	18.5
Bihar	5.9	6.5	12.4	5.5	6.9	44.4
Gujarat	1.8	3.0	4.8	2.6	2.1	54.1
Haryana	1.6	3.0	4.6	3.2	1.4	69.5
Himachal	0.3	0.1	0.3	0.1	0.2	36.3
J & K	0.6	0.3	0.8	0.5	0.3	62.5
Karnataka	2.1	2.5	4.6	2.3	2.3	50.8
Kerala	1.1	1.0	2.1	0.9	1.2	42.8
MP	4.2	6.0	10.2	3.5	6.7	34.3
Maharashtra	3.2	4.1	7.3	3.3	4.0	45.2
Orissa	2.3	3.6	5.9	2.4	3.5	40.6
Punjab	3.6	3.0	6.6	5.5	1.1	83.3
Rajasthan	2.4	2.8	5.2	3.6	1.6	69.2
TN	2.4	1.5	3.9	3.2	0.7	82.0
UP	13.2	12.5	25.7	17.7	8.0	68.8
WB	3.8	2.3	6.1	3.1	3.0	50.8
Other States	0.4	0.3	0.7	0.2	0.5	28.5
Union Teritorry	0.3	0.2	0.5	0.1	0.3	20.0
Total	54.9	58.5	113.9	63.3	50.1	55.8

Source : Statistical outline of India, Tata Services Ltd. 1984.

In all types of irrigation, the percentage of potential created in Punjab is 83.2 per cent, and in Haryana about 70 per cent. In UP it is a little less but in Bihar it is only 44.4 per cent. At the all-India level, the per cent is more than that in Bihar.

Table 13 below shows statewide irrigation potential created by ground water exploitation upto the 6th Plan. Here also Bihar lags behind.

TABLE 13
Statement Showing Statewise Irrigation Potential created by ground
water exploitation upto 6th Plan target

Sl. No.	Name of State/ union territory	ultimate feasible	Base level 79-80	For 1980-81 (addl)	During 1981-82 likely	Target 82-83	Target 6th Plan 1980-85	Total In' 000 ha
1	Bihar	4000	1410	105	135	140	940	
2	AP	2200	1045	40	45	50	250	
3	Assam	700	38	4	12	15	57	
4	Haryana	1500	1229	33	39	44	140	
5	Gujarat	1500	1319	19	30	38	155	
6	HP	50	6.5	.6	1.0	1.0	4	
7	J & K	150	5	neg	neg	—	5	
8	Karnataka	1200	420	10	10	15	225	
9	Kerala	300	20	2	5	10	50	
10	MP	3000	982	47	80	100	400	
11	Maharashtra	2000	1095	18	20	25	150	
12	Manipur	5	0.1	—	—	—	3	
13	Meghalaya	15	6.1	0.3	0.4	0.5	4	
14	Nagaland	5	neg	—	—	0.1	3	
15	Orissa	1500	290	29	70	100	350	
16	Punjab	3500	2880	45	45	45	235	
17	Rajasthan	2000	1490	26	25	23	125	
18	Sikkim	2	neg	—	—	—	—	
19	T.N.	1500	1090	27	26	26	150	
20	Tripura	15	4.5	0.36	.4	0.7	4	
21	UP	12000	8130	755	672	616	3820	
22	WB	2500	485	50	40	86	400	
	Total	40000	22000	1200	1250	1340	7000	

Source : Ground Water and Resources & Development Potential in India—Central Ground Water Control Board, Ministry of Irrigation, Govt of India New Delhi. Dec. 1982.

We must now talk a little of the relative merits or demerits of surface water exploitation and groundwater exploitation. For one thing, it is much easier and cheaper to exploit the latter, as compared with surface water which is difficult to store and manage. Whereas the big surface water projects, major and medium, take a long time to construct—with the inevitable cost and time overruns, the ground water exploitation is much easier to handle. Ofcourse, this has to be available in situ, for which extensive investigations are required in advance. The Central Ground-Water Board with its regional offices and its State counterparts are doing precisely that and the state governments must educate and encourage the farmers to make full use of this facility and resource available at hand and so cheaply. The big projects of irrigation, of which our engineers are so fond, take decades to design and build, require large areas of precious land for submergence and for distribution systems, are subject to serious evaporation and transmission losses, and demand colossal outlays for their completion. Drainage and waterlogging problems follow in their wake, causing a lot of distress to the farmers. The dams become exposed to siltation and the command areas need large sums of money for the full development of their potential. Above all, they are wasteful of water because the transmission losses by evaporation as well as soakage alone are as much as 40 per cent. And since water rates are based on area calculations, the farmer is not careful about its use, with the result that the Project itself is never profitable.

Groundwater on the other hand does not suffer from any of these infirmities. Once exploited, so cheaply and so easily, ground water is available on demand on a 'pushbutton' basis and this serves the needs of modern agriculture so admirably. No wonder that when the Green Revolution burst on the Indian scene in the Sixties, some states benefitted from it much more than some others. One reason for this difference was the exploitation of groundwater or the lack of it. BB Vohra⁹ has put it in the following words :

"It is not a mere accident that the Green Revolution should have first taken root in precisely those regions—the alluvial plains of the northwest and the deltaic plains of the South—where ground water is not only most readily available but has also been tapped for irrigation to the greatest extent. For, if there is one thing which the hyv seeds and multiple cropping patterns demand more than anything else for their success, it is water—water at the right time and in the right quantity. This is a requirement which can be met only by a source of irrigation that is completely under the farmer's own control; no surface irrigation system can even remotely hope to compete with groundwater in this respect. That the farmer has not been slow to appreciate the advantage of this 'push-button' irrigation, made possible by a pumpset or a tubewell of his own, is brought out vividly by the data on page following :

Vohra concluded that the initiative taken by millions of farmers and the managerial role played by them in the execution of their own small projects lay at the very root of what may be called the Ground Water Revolution. He went to the extent of saying that it would be in the public interest to avoid taking up surface

	(In '000's)				
	1950	1965	1969	1971	1978-79
1. Private Tubewells	3	100	279	470	4655 (*)
2. Diesel Pumpset	66	471	837	1150	2650 (*)
3. Electric Pumpsets	19	513	1080	1620	3950

Note : 1978-79 figures added from "Indian Agriculture" in Brief—19th Edition—figures under private tubewells shown for that year represent Irrigation Pumpsets/Tubewells energised.

water projects wherever irrigation from groundwater is technically and economically feasible. He in the end advised that

"Conditions must also be created to encourage groundwater development to the fullest possible by carrying out land reforms and consolidation of holdings by undertaking scientific investigations designed to ascertain the limits of safe pumping in given areas, by providing technical advice and guidance to farmers, by arranging for loan assistance on an adequate scale and by making sure that tubewells do not remain idle on account of lack of electricity or diesel. In situations of limited supply of groundwater, statutory powers must also be exercised to regulate development."¹⁰

Minor irrigation must get far greater attention and a larger share of the nation's resources in view of its comparative cheapness in cost per hectare, its short gestation period and the scope that exists for providing employment opportunities and augmenting food production in areas otherwise bereft of irrigation facilities.

At the macro level there is urgent need to revise the priorities to concentrate on ongoing projects and consolidate the gains by developing command areas (more about it later). At the microlevel the project planning, implementation, monitoring and evaluation would need to be improved. There necessarily has to be a coordinated approach by the centre and the states to ensure that the national plans are translated into reality and the plan targets are adhered to.

In brief : a careful look at the above tables 10 to 13 above will show that

- (i) by 1979-80, only about 50 per cent of the total irrigation potential had been tapped on major, medium and minor irrigation sides. The rest needed to be taken up urgently because irrigation water was a 'must' for the success of the Green Revolution; but
- (ii) it would be very much cheaper and quicker to exploit the ground water potential. It was heartening to note that in the country as a whole there was now a realisation in favour of tubewells for augmenting agriculture under modern technology;
- (iii) the actual utilisation of the irrigation potential created on the major and medium sides was more important than merely creating new potential.

- Command Area Development Schemes (see next section) had been conceived with that object in view;
- (iv) ground water potential should be exploited in preference to surface water provided it is technically and economically feasible;
 - (v) among the states of Punjab, Haryana, UP and Bihar—Bihar upto 1982-83 had created the least irrigation potential out of the total ultimate potential available from all sources. Punjab was leading with 83.3 per cent exploitation, followed by Haryana 69.5 per cent, UP 68.8 per cent and Bihar only 44.4 per cent;
 - (vi) in ground water exploitation also, Punjab was leading with 73 per cent followed by Haryana 70 per cent, UP 29 per cent and Bihar only 21 per cent. There is a lot of investigated material available with the Central Ground-Water Board about Bihar and some other states which can be utilised by the state governments concerned.

This shows that Bihar has not used its water resources adequately. Even UP could have done still better. The prosperity of Punjab in agricultural production, as observed already, is quite a lot due to the high percentage of irrigation available to its cropped area. Haryana has also done well in this behalf, considering the undulating, dry terrain it is faced with in its south western districts.

Hanumantha Rao dealing with irrigation increase from tubewells observed as under :

“Punjab, Haryana and UP which were significantly above the national average in respect of irrigation, recorded much higher increases than the national average in the periods 1961-62 to 1969-70, mainly due to steep increase in irrigation from private tubewells in these states. They occupied as much as 45 per cent of irrigated area from wells in the country in 61-62 and improved their share in well irrigation to 52 per cent in 1969-70.”¹¹

For the success of the Green Revolution irrigation policies in general should envisage the following :

- (i) maximum production per unit area through multicropping in areas with ample water resources;
- (ii) maximum production per unit of water in regions of medium and low rainfall, in which a large part of the country lies;
- (iii) provisions of maximum protection in drought areas;
- (iv) irrigation of maximum area during the rainy season by supplementing the rain;
- (v) maximum utilisation of irrigation supplies from storage during the eight months of the year excluding summer months when evaporation losses are highest;

- (vi) conjunctive use of surface water and ground water. In supplemental irrigation in canal tracts, groundwater is best exploited by farmers and they should be encouraged to do so with the supply of credit and technical advice.

NOTES

1. According to the Central Irrigation Ministry's Annual Report 1983-84, the total water resources of the country are assessed at 176.8 mham only—a part of which can be utilised. It has been assessed that about 67 mham of surface water and 26.5 mham of ground water can be tapped and utilised. These estimates are more conservative than those by the NCA.
2. Abridged Report of the N.C.A., (1976) p. 186.
3. Annual Report of Ministry of Irrigation (1983-84), Government of India p. 10.
4. Annual Report 1984-85, Ministry of Irrigation & Power, New Delhi p. 1.
5. Venkateswarlu—Dynamics of Green Revolution in India—*Ibid*—pp. 126-127.
6. "Irrigation Policies in India" by SP Malhotra—two Articles in Times of India Delhi—2/3-8-84.
7. SP Malhotra—*Ibid*.
8. Annual Report of the Irrigation Ministry, Government of India 1984-85; pp. 65-66.
9. BB Vohra "Land and Water Management Problems in India" 1975, Deptt of Personnel and Administrative Reforms, New Delhi p. 88.
10. BB Vohra 'A Policy for water'—Paper presented at the Seminar on "The Role of Irrigation in the Development of India's Agriculture" held by the Institute for Social & Economic Change, Bangalore, Oct. 1974.
11. CH Hanumantha Rao—"Technological Change and Distribution of Gains in Indian Agriculture" Macmillan, New Delhi 1975—1980, p. 96.

(V) COMMAND AREA DEVELOPMENT (CAD)

After Independence, the State irrigation departments in the normal course have been attending only to the maintenance of headworks, canals and distributaries of irrigation projects, major and medium, leaving actual utilisation of water to the farmers. The tail-enders [in the latter case always found it difficult to cooperate in the construction of channels, with the result that the proper utilisation of irrigation potential had suffered. Unlike the early irrigation works, which benefitted the plains and the delta areas, most of the new projects have commanded uneven and difficult terrain. Experience has shown that unless irrigation development was carefully planned and certain prerequisites provided in the command areas, neither the potential created was fully or expeditiously utilised nor agricultural production could pick up in the affected areas, much less get modernised.

There was generally a timelag between the creation of irrigation potential and its actual utilisation. In fact, large investments were necessarily to be made at

the farm level by way of landshaping, land levelling, construction of water courses and drainage systems where necessary. Even the cultivator was to get used to a change over from rainfed agriculture to new irrigated modern farming. With modern agriculture are allied many other concomitant activities which, if carried out in a well planned and coordinated manner, turn out to be more effective and economical. No wonder the need for an integrated development administration for each command area had been felt over a period.

A centrally sponsored Command Area Development Programme (CADP) was launched on January 1975 to fill the gap in the utilisation potential in selected major/medium irrigation projects in the country. The Programme broadly covered on-farm-development (OFD) works which include soil surveys, land shaping, construction of field channels, field drains, farm roads, consolidation of holdings, realignment of boundaries, introduction of "warabandi" to ensure equitable and assured supply of water to each and every farm holding, arrangements for supply of inputs and credit, agricultural extension, construction of markets and godowns and development of ground water for conjunctive use. This multi departmental approach would ensure the coordinated overall development effort of all sectors in the command areas.

The programme which earlier (upto March 1980) covered 76 major/medium projects in 16 states and one union territory covering an ultimate irrigation potential of 15.3 mha was expanded from 1983-84 to include 29 new projects. With the deletion of 3 old projects it now covers 102 projects in 17 states and one UT, with a total area of about 17 million hectares.¹

The financial pattern consists of central assistance to the states on a matching basis besides institutional credit for on-farm-development schemes. Grants are given for some activities on a matching basis, including for subsidy on loans to small and marginal farmers on the IRDP pattern for land levelling and shaping, construction of field drains, sprinkler and drip irrigation, construction of field channels and so on.

The Sixth Plan envisaged an outlay of Rs. 857 crores on CAD Schemes out of which central sector had to provide Rs. 300 crores plus Rs. 110 crores from Institutional credit/loan for OFD works. Outlay for 1983-84 was Rs. 87 crores in the central sector, with Rs. 97 crores provided for 1984-85, including Rs. 15 crores for the incentive schemes.

The performance in 1983-84 is reported to have been good. Against a 40 lakh ha target for field channels in Sixth Plan, the achievement in 1982-83 was 11.56 lakh ha giving a total 27.87 lakh ha in first three years of the Plan. AP, Bihar, MP, Orissa and UP are among the states which showed very good progress in this behalf. By 1983-84 itself, the target of 4 mha had been exceeded. In land levelling 6th Plan target was 10 lakh ha of which progress in 1982-83 was 2.61 lakh ha, though its cost was high. Against a target of 5 lakh ha for coverage under 'warabandi' in 1982-83 the achievement was 4.49 lakh ha. Target for 1983-84 was 4.5 lakh ha. States had been advised to step up their efforts in this behalf.

The basic objective of command area development was to increase utilisation of the already created irrigation potential to achieve higher agricultural production as well as productivity. As a result of the increased availability of water to reach the

fields and the controlled and timely application of water, plus taking up of on-farm-development works, there has been a considerable increase in the yield per ha in the project areas.

In any programme of command area development, the emphasis naturally has to be on full utilisation of available water resources; but that alone is not sufficient to ensure maximum production in agriculture. It will be necessary at the same time to provide the inputs and supporting services and adequate agricultural infrastructure built up. An integrated development of the command area will have to include consolidation of holdings, supply of farmers' needs in respect of credit, seeds, fertilisers, pesticides and machinery etc., availability of research facilities to cater to the special needs of the area, improvement of market and communication facilities, storages and development of mandi towns, processing and agro-industries, proper planning of new centres of urban concentration linked with agriculture, supplemental irrigation from groundwater resources to make multiple cropping possible and for insuring against failure in surface water supplies and last but not least, for the diversification of agriculture including mixed farming programmes.

In short, a Command Area Development Programme (CADP) is a 'micro-cosm'—a concentrated one—of the entire gamut of modern agriculture, starting with the availability of irrigation water for the command area. The more efficient a manner in which this programme is planned and administered, the better will it be for the success of a campaign for agricultural production, in fact, for the success of the Green Revolution as such.

NOTE

1. Report of the Irrigation Ministry, Govt. of India 1984-85, p 11.

(vi) USE OF FERTILISERS (CHEMICAL)

The addition of chemical fertilisers as plant nutrient is a necessary step in agricultural production under the new strategy governing Green Revolution. The scope of bringing any new areas under cultivation is now almost NIL; further additions to foodgrains production can be made only by multiple-cropping provided water and chemical fertilisers are fed in as inputs, along with hyv seeds. Experiments have shown economic returns even under rainfed conditions provided the correct type and quantity of fertilisers are chosen and applied judiciously.

If the doses of chemical fertilisers are supplemented by the rotation of leguminous crops occasionally, and by the blue green algae where possible in waterlogged areas, the additional production is greater than with chemical fertilisers alone.

The hyv seeds require doses of chemical fertiliser nutrients because the soil reserve and its natural recuperative processes alone are not enough. "Whatever may be the soil water complex, there should be a well planned cropping system providing nutrients for growing crops, in sequence or rotation, in order to build up the soil to a high state of productivity¹."

Fertiliser requirements, including the ratio of N.P. & K, have to be assessed carefully for achieving certain levels of agricultural production and related to actual performance in the field.

Where irrigation is available the use of chemical fertilisers is a must, if productivity of modern agriculture is the objective. In result, fertiliser consumption has been on the increase over the years in India, particularly after the introduction of hyv seeds in the mid sixties. There was only a slow rise in its use in the period 1951-52 to 1964-65 covering the First, Second and nearly half of the Third Plan periods but, there after, as the Green Revolution, first in wheat and then in rice etc. took root, the consumption increased remarkably. Consumption will increase further, as irrigation spreads in the country.

A study has shown that in 1968-69 less than 15% of the districts (out of total 286) accounted for 60% of the total fertiliser use in the country that year while more than 50% accounted for only 10%. Less than one third of the districts accounted for 70-80% of the fertiliser use during 1960-61 to 1968-69². The growth rate of fertiliser use varied among the districts mainly because of the difference in the levels of irrigation, cropping pattern and the pace of adoption of hyv seeds in different states. In other words; the consumption of fertilisers was mainly in areas where Green Revolution was catching up.

The fertiliser consumption growth, however, slowed down from 1971-72 because of its poor availability, high prices due to the oil crisis and the resulting need for its more economic and efficient use. It was seen for certain "that it was economical per unit of fertiliser, to use the optimum rather than the maximising dose because of the application of the law of diminishing returns holding good equally for hyv seeds."³

Plant nutrients should be made available in a balanced manner and at the appropriate time otherwise their full benefit would not be achieved. A well designed distribution system is, therefore, important and equally important is the maintenance of quality and price of chemical fertilisers in the chain of distribution. A correct measure of nutrient balance, it may be stated here, should be based on the ratio in which the N, P & K appear in fertiliser recommendations, resulting from field trials. It may be remembered that nutrients available to plants at the time of demand have to be most efficiently used. Methods of application of fertilisers and their efficient utilisation have to be considered in relation to the root system of the crops and their pattern of development in the soil medium. Further

"Micro nutrient deficiency in crops is remedied by soil application or foliar spray. The awareness of this deficiency has increased recently as a result of the spectacular yield increase of hyv wheat and paddy by the application of zinc. With further growth of intensive cultivation constant watch should be kept on micronutrient deficiency and its removal."⁴

The presence of organic matter in the soil should be ensured by the use of rural compost but through the gobargas plants in very large numbers. These will obviate the use of dung as fuel for the kitchen.

Soil testing is an essential element in the evaluation of the nutrient status of the

soil. While recommending fertiliser doses it should be ensured that they are appropriate for the soil to be used, the crop to be grown and the level of farm management. The performance of the mobile testing labs may be constantly evaluated in this connection.

Table 14 on pages 86-87 relating to the consumption of chemical fertilisers in the states of India at various stages is revealing. Punjab and Haryana with only 6 per cent of the country's cropped area, consumed 18 per cent of the fertilisers used in the country in 1981-82. Punjab led in per cropped/irrigated area consumption of fertilisers in the same year. See figures below also :

(In KGs per ha)

State	Consumption per cropped ha	Consumption per Irrigated ha
Punjab	151	251
UP	56	140
Haryana	49	131
Andhra P.	51	179
Tamil Nadu	70	179

In a decade between 1971-72 to 1981-82, consumption in Punjab increased more than three times—from 2,90,000 tonnes to 8,20,000. In UP, the biggest consumer because of its area, the increase in the same period was less than 3 times. It is more than 3 times in Haryana and more than two times in Andhra, Gujarat, Karnatak, MP, Maharashtra, Rajasthan and West Bengal.

Consumption of fertilisers per ha in southern ricegrowing states of AP, TN and Kerala was more than the all India average in pre Green Revolution period i. e. upto 1964-65. It continued to be higher even in 1971-72-Tamil Nadu being the highest. But the rate of increase for these states was lower than the country's average. Bihar, Orissa, Rajasthan & UP recorded growth higher than the national average.

Interstate disparities in per ha consumption declined. Punjab, Haryana and UP improved their share in irrigation through investment in private wells and also improved their share in fertiliser consumption from 17 per cent of all India consumption in 1964-65 to 32 per cent in 1971-72.⁵

General Observations

(i) Our total consumption of chemical fertilisers now is over 8 m. t. annually. In the early 60s, the USA was consuming only 4 m.t. reaching 10.6 m. t. in a few years. The USSR was consuming 1.4 m.t. earlier but it reached 8.5 m. t. by 1980. China consumed less than 0.3 m. t. till 1973 but thereafter its consumption jumped up to a level of 4.5 m. t. by 1976, reaching 12 m. t. by 1980. India started with 0.4 m. t. during 1963 and crossed 8 m. t. in 1984-85. India now ranks fourth in the world in terms of gross fertilisers consumption, next only to USA, USSR and China.

(ii) In 1964-65, Bihar, Gujarat, Karnatak, MP, Maharashtra, Orissa, Rajasthan and UP were using less than 5 kg/ha, while A.P., Kerala, Punjab (including Haryana then) TN and West Bengal were using more than 5 kg/ha only. TN and Kerala

crossed 10 kg. All India average was 4.5. kg/ha. By 1982-83, out of a total consumption of more than 7 m. t. all India, States of AP, Haryana, Punjab, TN and UP were using more than 40 kg/ha: states of Gujarat, Karnatak, Maharashtra and West Bengal between 20-40 kg/ha. Punjab led with 127.8 kg/ha followed by UP 60.5 kg, TN 58.6 kg and AP 53 kg/ha, Haryana being fifth with 47.4 kg. Bihar did only 18 kg/ha.

(iii) A look at the consumption Table 14 reveals that if we compare the per cent of Irrigated area in a state with the per cent of fertilisers used in that State, vis a vis all India in both cases, the states of AP, Haryana, Gujarat, Karnatak, Maharashtra, Punjab and UP have had more share of fertiliser than irrigation per cent entitled them to. On the other hand, states of Bihar, Kerala, MP, Orissa, TN, Rajasthan and West Bengal have utilised less fertiliser than their irrigated area warranted. This is only a theoretical indicator of the scope to increase our overall use of fertilisers. As irrigation goes up especially when supplemented by the exploitation of groundwater (dealt with elsewhere) in the same states, our fertiliser consumption must increase by leaps and bounds. Punjab, in any case, sets the pace in per hectare consumption. At the all India level, the present level of consumption must double, to get expected results. Greater emphasis on fertiliser use is needed in N.E. states. Even Central and western states must also catch up with the Andhra and TN levels.

(iv) Venkateswarlu has made the following comment in his book 'Dynamics of the Green Revolution in India' on the effect of fertiliser use on our productivity :—

"Now agricultural productivity has shown only some increase from 1961 to 1980 viz., from 780 to 1000 kg/ha even though fertiliser consumption improved from less than 10 kg/ha to 34 kg in 1980. Increase was not proportionate any way. Two reasons could possibly be (a) Indian soil-farming system was non-responsive to fertiliser application and (b) the consumed fertiliser was not adequate enough to stimulate productivity. Andhra Pradesh and even Punjab showed that unless consumption increased to 50 kg/ha and above, there was no related response in productivity. Lesser users have made no dent in productivity. In UP consumption has gone beyond 50 kg—it is 54, even 60 kg. There should now be a spurt in productivity in that state.

"A single-point strategy for increasing production emerges out to be "fertiliser" besides irrigation. Considering the requirements of fertilisers for cognizable increase in production, it has to go a long way, probably almost double the present level of consumption, so as to get the expected results———The problem states should concentrate on "one-point strategy" of fertiliser consumption to step up production while taking care of the other important constraints that are neutralising the gains accrued through modern technology."*

(v) An appropriate blend of organic and inorganic fertiliser application would stimulate crop productivity. Agriculturally advanced countries like Japan, China and Australia apply them on equal basis. In Japan, 60-100 kg of organic matter is coupled with 100-150 kg of inorganic fertiliser.

TABLE
Statewise—Consumption

	State	1978-79		1978-79		1971-72		1975-76		1980-81	
		Crop- ped area	% all India	Net ir- rigated area	% all India	Total con- sum- tion	% all India	Total con- sum- tion	% all India	Total con- sump- tion	% all India
1	2	3	4	5	6	7	8	9	10	11	12
1	AP	12,794	8	3,655	10	296	11	329	11	576	10
2	Bihar	10,895	7	2,960	8	108	4	124	4	204	4
3	Haryana	5,150	3	1,918	5	82	3	97	3	231	4
4	Gujarat	10,420	6	1,715	5	182	7	150	5	357	6
5	Karnatak	10,417	6	1,409	3	167	6	204	7	344	6
6	Kerala	2,758	2	228	1	65	2	63	2	98	2
7	MP	19,653	12	2,317	6	123	5	113	4	197	4
8	Maharashtra	19,197	12	1,896	5	241	9	257	9	421	8
9	Orissa	7446	5	1,148	3	50	2	52	2	76	1
10	Punjab	5441	3	3262	9	290	11	295	10	754	14
11	Rajasthan	16,657	10	2,895	8	58	2	79	3	135	2
12	TN	7,309	4	2,873	8	346	14	286	10	491	9
13	UP	22,709	14	8892	23	463	17	488	17	1151	21
14	W Bengal	6,653	4	1,489	4	95	4	131	5	283	5
15	All India	1,63,026	100	37,963	100	2,656	100	2,894	100	5,516	100

Sources : Indian Agriculture in Brief 1982 pp. 308-309 ; IFFCO Statistical outline 1983 (1982-83 figures) FAI ; Fertiliser Statistics for 1964-65 and 1970-71.

Notes : (i) Figures in brackets show Total Consumption in '000 T

(ii) Distribution of fertilisers in 1983-84 exceeded 7.2 mt. and in 1984-85 more than 8 mt.

(iii) H stands for Haryana

14

of Fertilisers

(Area in '000 Ha)
(Consumption in '000 T)

1981-82		1982-83		Per hectare consumption (in K.Gs)					Distribution in %	
Total con- sump- tion	% all India	Total con- sump- tion	% all India	1964-65	1970-71	% Change	1980-81	1982-83	1964-65	1970-71
13	14	15	16	17	18	19	20	21	22	23
656	11	726	10.5	8.2	22.6	174.2	45.9	53	14.8	11.3
205	3	212	3.1	2.1	9.8	361.8	17.7	18	3.2	4.1
252	4	363	5.3	—	—	—	42.5	47.4	—	—
401	7	402	5.8	4.7	17.9	283.5	34.5	38.7	6.7	7.0
384	6	401	5.8	4.7	15.5	276.6	31.2	38.3	7.2	6.4
95	2	108	1.6	10.1	22.3	119.8	33.4	—	3.5	2.5
236	4	240	3.5	1.7	5.8	245.2	9.2	11	4.5	4.5
529	9	523	7.7	4.4	12.4	184.9	21.2	26.3	11.8	9.2
82	2	86	1.2	1.4	6.0	319.0	9.6	10.8	1.5	1.9
820	14	886	12.9	6.3 (incl H)	35.6 (incl H)	466.3	117.9	1278	9 (incl H)	14.9 (incl H)
138	2	161	2.3	0.7	5.0	601.4	8.0	—	1.5	2.7
513	8	465	6.7	15.4	48.3	214.0	53.2	58.6	15.5	13.2
1270	21	1630	23.7	2.5	20.9	725.7	49.3	60.5	7.9	18.3
258	4	262	3.8	5.9	13.5	130.2	35.9	3.3	5.5	3.6
6,064	100	6,871	100	4.5	16.0	16.0	32.0	36.6	100 (711)	100 (2611)

(vi) There is need to have a combination of fertilisers and pesticides also though the concept of mixing the two is moving in slowly.

The importance of realisation of increasing fertiliser use efficiency must be emphasised, "Its use in the shape of granules at the base would be more efficient since plant requirements are gradual in time and the entry into the plant system is slow". Experiments have to be made on a large scale. A lot of work on the subject has been done by the IRRI Manila.

(vii) Govt. of India has been trying vigorously to increase the consumption of fertilisers in the country. It has reduced prices by 10 per cent (1983-84), increased the profit margins of distributors, streamlined the supply line by importing fertilisers, opening of additional fertiliser sale points, augmenting indigenous production (crossed 5 m. t. annually already), increasing the short term credit limits to states for fertiliser distribution and, last but not least, enforcing the quality control vigorously. The business of manufacturing, import and sale of chemical fertilisers in India has to increase manifold. See Table 15 below. India is a long way to go in becoming self sufficient in fertilisers.

TABLE 15
All India Production and Consumption of Fertilisers
(1980-81—1984-85)

(Production ('000 Tonnes))			
Year	N	P ₂ O ₅	Total
1980-81	2,164	841	3,005
1981-82	3,143	950	4,093
1982-83	3,430	984	4,414
1983-84	3,495	1,064	4,559
1984-85	3,917	1,318	52,35

Consumption & Imports (approx) ('000 Tonnes)

Year	N	P ₂ O ₅	K ₂ O	Total	Imports
1980-81 *	3,678	1,214	624	5,516	2,511
1981-82 *	4,069	1,322	676	6,067	1,974
1982-83**	4,242	1,433	726	6,401	1,987
1983-84**	5,236	1,757	799	7,792	3,233
1984-85**	5,644	1,867	865	8,376	3,141

* : February to January basis.

** : April to March basis.

Projected Consumption ('000 Tonnes)

Year	N	P ₂ O ₅	K ₂ O	Total
1985-86	6,140	1,955	1,050	9,145
1986-87	6,477	2,200	1,117	9,794
1987-88	6,887	2,353	1,194	10,434
1988-89	7,311	2,517	1,276	11,104
1989-90	7,734	2,687	1,359	11,780

NOTES

1. Abridged Report of the National Commission on Agriculture 1976; p. 480
2. NCA. *Ibid.* p. 283
3. NCA. *Ibid.* p. 484
4. NCA. *Ibid.* p. 486
5. C. H. Hanumantha Rao—*Ibid.*,—p. 98.
6. Venkateswarlu—"Dynamics of Green Revolution in India", Agricole Publishing Academy, New Delhi 1985, pp, 269-270.

(vii) USE OF INSECTICIDES AND PESTICIDES

In the farmers' efforts to increase agricultural production under the New Technology, the biggest challenge on the negative side is from pests, insects, weeds and rodents etc. DDT was the first to come in with insecticidal properties to meet that challenge, followed by other chemicals which are specific in their action, things like insecticides, fungicides, rodenticides, weedicides, mematicides, acaricides and so on.

The use of water and fertilisers not only helps the luxurious growth of plants we want but also of pests, weeds and diseases near around, affecting the quantum of yield in those plants. These weeds, pests and diseases have to be checked by recommended doses of plant protection chemicals used in requisite quantities.

The dosage of chemicals, number of applications and time of application are important factors in determining the efficiency of chemicals. Successful control is based only on the identification of pests, accurate knowledge of the life history and habits of the organisms and the host-parasite interaction. Also important are the critical stages of the host plants and pest intensity for regulating the use of chemicals and obtaining the maximum efficiency.

With the changing cropping patterns pest surveillance should become an integral part of crop production. The first diseases surveillance in this country related to wheat diseases in 1966-67, followed by ad hoc rice survey and surveillance of rice pests and diseases in 1970, 1971 and 1972. The Plant Pests & Diseases Surveillance Service was organised in 1969-70 in 4 selected districts of the IADP; later these were multiplied many times.

Over 30 million ha of cropped area in the country is affected by various pests and diseases every year, taking an annual toll of 5 to 25 per cent of agricultural production¹. Detection of pests and disease build up and timely remedial measures hold the key to a successful plant protection strategy. Apart from the use of pesticides the biological control of pests must also be explored and used.

The anticipated demand for various pesticides was estimated at 75,000 Tonnes (technical grade material) in the year 1984-85, mostly produced in the country and distributed to cover 36.37 lakh ha during the year, with central assistance of Rs. 380 lakhs.²

Punjab was to use 4400 tonnes of pesticides in the year. Quantitatively the following states were allotted bigger shares :³

	<i>Pesticides</i>	<i>Total foodgrain area ('000 ha)</i>
A.P.	15,500 tonnes	8,756
Gujarat	6,600 tonnes	4,472
MP	6,000 tonnes	17,797
Maharashtra	4,500 tonnes	14,050
T.N.	8,540 tonnes	4,109
U.P.	8,200 tonnes	20,472
Punjab	4,400 tonnes	4,843

The practice of rapid roving surveys helps the state agencies in early detection of diseases/pest attacks and taking remedial measures to save the crops. Strict enforcement of quality control measures, as also strict standards of registration of pesticides to ensure efficacy and safety standards, have been the major aspect of pest-control and plant protection policy. Close liason with the pesticides industry ensures quality through cooperation and reasonable prices. An integrated pest management thus exists in the country now.

NOTES

1. Annual Report of Ministry of Agriculture 1983-84.
2. Annual Report of the Department of Agriculture Govt. of India 1983-84.
3. Indian Agriculture in Brief—ESA. Ministry of Agriculture Govt. of India—1982—P 313.

(viii) AGRICULTURAL CREDIT-SUPPLY OF

Credit is the most crucial input in all agricultural developmental programmes. The other inputs viz., technology, hyv seeds, fertilisers, pesticides, irrigation water and machinery—all depend on the availability of credit. To a large majority of farmers in India, credit is not merely one of the inputs, it also gives them command over supplies and services required. Ours is essentially a small-farm economy; the small and marginal farmers donot have own resources to invest in agriculture. It is, therefore, necessary to arrange timely institutional credit for them, to ensure that they carry out their agricultural production programmes by adopting modern technology and improved farm practices. Since the operations under the programme are spreading, a massive expansion of agricultural credit, with a smooth and easy flow to the farmers, is a must. The need for simplifying lending procedures and making credit available at the doorsteps of the cultivators has also been now realised and an attempt is being made to reduce formalities.

The credit institutions in general, and long term lending institutions in particular, have been advised to strengthen their technical supporting staff for the farmers and to improve the quality of lending operations.

A multiagency approach has been adopted in making credit available. It includes Cooperatives, Commercial Banks and Regional Rural Banks (RRB). The Cooperatives operate at three levels—agricultural credit societies at the village level, central cooperative banks at district level and the state cooperative banks at the state headquarters level, supplying short term production credit and medium term investment credit to farms. Long term credit is provided by Land Mortgage Banks at the primary and state levels.

Commercial banks had 42079 rural branches by 30 June 1983; by June 1983; there were 142 regional rural banks covering 247 districts. In the year 1983-84 the cooperatives had issued credit of Rs. 2,732 crores whereas in 1979-90, the disbursement was only Rs. 1,936 crores.

By March 1984, commercial banks had advanced to agriculture, including indirect finance that is, Rs. 5967 crores. This included disbursement of refinance of Rs. 1245 crores by NABARD under their schematic lending provision.¹ More than 40 per cent of the total loans issued by cooperatives is estimated to have gone to the weaker section of the society; many other concessions were given to the latter like cheaper rate of interest and ignoring of default if it did not exceed 10 per cent of the previous loan. Inspite of these concessions, position still persisted that major part of the loans had gone to the big farmers in the cooperative as well as the commercial banks lending. Small and marginal farmer still required special attention in this regard.

At any rate, cooperative banking institutions are providing support to agricultural programmes by providing institutional credit as short, medium and long term loans. Cooperatives have also assumed the responsibility for processing and marketing of agricultural produce. Storage facilities are also being provided by them to some extent. The primary agricultural credit societies have been organised with a strong professional and financial base. Farmer Service Societies (FSS) have been set up to start various activities to help the agricultural sector. Managerial cadres

have been formed at various levels to ensure smooth-functioning of the cooperative agencies. There exist a number of apex organisations for guiding and coordinating the functions of grass root level societies to ensure socio-economic development.

Credit support to weaker sections

Special efforts are being made to afford credit to small and marginal farmers and other weaker sections of rural areas. Relaxations like lower down payment, longer maturity period, lower rate of interest etc., apply in respect of loans to them. NABARD has prescribed that at least 20 per cent of the total cooperative loans should necessarily go to weaker sections. Small and marginal farmers are eligible to get fresh loans from cooperatives, even if they are in default, upto 10 per cent of their previous loans. As a result of these measures the share of weaker sections in these loans (cooperative) is more than 40 per cent. A minimum limit is fixed for loans given by commercial banks also. A further impetus to give priority funds to the weaker sections is given by the 20 Point Programme also.

Procedural formalities regarding application forms sanctions, security conditions and disbursement have been simplified for them, in the cooperatives as well as commercial banks.

The mounting overdues in the cooperative credit sector have been a matter of concern as these obstruct credit expansion. By June 1983, the % of over-dues to demand at the central cooperative bank level stood at 40 per cent and more at the primary level. Same was the situation with the primary land development banks. In the case of commercial banks loans also, the overdues were around 47 per cent.² So far as cooperatives are concerned, the answer lies in enforcing the linkage of credit with marketing.

Punjab

It is the availability of credit to the farmer which will determine the pace of growth of his agriculture. A 1977 Survey revealed in Punjab State that large farmers got the major share of agricultural credit and credit allocation followed the pattern of land distribution. In 1966-67 and 1967-68. the cooperatives catered to only 37 to 39.8 per cent of total requirements—the balance was met by money lenders, friends and relatives. A more recent study revealed that the share of non-institutional agencies in financing agriculture continued to be predominant, with commission agents contributing 37 per cent and money lenders 18 (government 19 per cent and cooperatives 34.38 per cent).³

In respect of long term credit, a 1967-68 survey revealed that cooperative land mortgage banks met only 44.5 per cent of the needs—the balance was borrowed from other sources.

Normally credit per acre extended by the cooperatives is found to increase significantly with increase in the area. When concentration of land assets is higher, the concentration of cooperative credit is also higher—an indicator of political power of the large farmers. But in the Punjab concentration of assets is the lowest among

all states, so is the concentration of cooperative credit and yet Punjab is the seat of technology change in agriculture. In the southern and eastern states, the concentration of assets as well as of cooperative credit is higher than the national average.'⁴

NOTES

1. Annual Report Deptt. of Agriculture, Govt. of India 1984-85 p. 124.
2. Annual Report Deptt. of Agriculture Govt. of India 1983-84 p. 125.
3. Pritam Singh—"Emerging Pattern of Punjab Economy" Sterling Publishers, New Delhi-1983, p. 86.
4. Ch. Hanumantha Rao—"Tech. Change & Distribution of Gains in Indian Agriculture"—Macmillan, 1975/80, p. 138.

(ix) RURAL ELECTRIFICATION

Electricity is an essential input in modernised agriculture. It can be used for lifting water by tubewells/pumpsets, processing and preserving agricultural produce, sprinkler irrigation, small industries and domestic lighting etc. Most important : that it plays a great part in modernising the entire outlook of the rural population. Many studies made in the 70's showed that electricity makes a significant contribution to the development of agriculture. Most importantly electric pumps are cheaper in capital and operational costs than diesel pumps. Speedy development of ground water, so vital for the green revolution, requires that power should be made available for the purpose round the clock and at reasonable rates.

At Independence hardly 1300 villages had been electrified and only 6400 energised pumpsets were working in the entire country. Programme of rural electrification was taken up in right earnest in the five year plans. At the end of the IV Plan about 1,55,297 villages were electrified and there were 2.4 m. pumpsets. By 1982-83, the number of electrified villages was 3,20,982 (55.7 per cent) and number of pumpsets had gone upto well nigh 5-million. See Table 16 on next page regarding rural electrification.

In Punjab (reorganised), the number of tubewells running with electricity in 1965-66 was 25,296 ; by 1982-83 the number went upto 3,33,000. The success of the green revolution is explained partly by this fact. A tubewell gives requisite quantity of irrigation water on a 'push-button' basis.

The revenue returns from staterun tubewells are very low, taking into account the huge capital investment the State Electricity Boards have to make for the energisation of tubewells. It is thus an uneconomical programme for them ; to

TABLE 16
Progress of Rural Electrification—Statewise

	State	Villages electrified			Pumps energised ('000)	
		1982-83	%	1965-66	1982-83 (in '000)	1965-66
1	Andhra	20,661	(75.9)	4,099	547	57
2	Assam	6,892	(31.3)	66	2	11
3	Bihar	29,187	(43.2)	3,744	182	—
4	Gujarat	14,030	(76.8)	1,671	262	17
5	Haryana	6,731	(100.0)	1,179	252	15
6	Himachal	12,794	(75.6)	1,438	2	—
7	J & K	5,214	(80.2)	383	1	—
8	Karnatak	18,381	(68.5)	4,627	358	42
9	Kerala	1,268	(100.0)	1,083	111	7
10	MP	32,838	(46.3)	1,133	393	7
11	Maharashtra	30,866	(86.3)	4,273	791	45
12	Orissa	21,280	(45.3)	534	23	—
13	Punjab	12,126	(100.0)	3,697	333	25
14	Rajasthan	16,708	(50.2)	1,115	242	7
15	TN	15,636	(94.4)	7,830	965	257
16	UP	53,367	(47.4)	5,855	461	17
17	WB	17,594	(46.2)	1,594	27	—
	All India	320,982	(55.7)	45,144	4979	513

Source : Statistical outlines of India 1984 p. 67.
Tata Services Ltd. Deptt. E & S. Bombay.

Note : (i) Figures in brackets show the % of electrified villages to the total number of villages in each state.

(ii) Revised figures for 1982-83 = 323881 ; as on 31.1.84 = 333878 or 58%

compensate the Boards for this loss, the state governments will have to give subsidies. The programme has to be expanded since it is vital for production under the new technology.

Let us see on next page the annual per capita consumption of electricity for irrigation (1967-68) statewise as also consumption of electricity in agriculture sector, compared with total consumption (1979-80) :—

Consumption of Electricity	Per capita consumption in irrigation (in kwh) (1967-68)	Consumption in Agriculture sector (in GWH) (1979-80)		A as % of T
		A	T	
Tamil Nadu	27.93	2180.3	8138.2	28.7
Haryana	11.78	926.0	2347.6	39.4
Punjab	10.86	1897.6	4909.5	33.7
Gujarat	8.98	1246.7	7305.5	17.0
Andhra P.	6.03	977.30	4605.07	21.2
Uttar Pradesh	4.15	2548.0	7610.7	33.4
Maharashtra	3.31	1346.7	12897.7	10.4
Karnatak	3.28	367.9	4853.9	7.6
Kerala	1.85	98.43	2447.4	4.0
Rajasthan	1.55	805.3	2335.1	27.4
J. & K.	1.13	23.25	420.9	5.5
Bihar	1.13	269.9	3941.4	6.8
Assam	0.69	2.80	605.09	—
MP	0.55	430.9	4345.8	9.9
WB	0.26	77.0	5663.7	1.4
Orissa	0.16	33.5	2251.7	1.5
India	5.03	13189.2	78225.8	16.9

Note. A stands for Agriculture and T for Total.

Source :—(i) Statistical Abstract of Punjab 1969.

(ii) Indian Agriculture in Brief, 1982, Page 319-21.

(x) RURAL ROADS AND MARKETING

(A) *Rural Roads* are necessary not only for the marketing of agricultural produce but also for the supply of numerous inputs and mobility of extension workers and for distributing consumer goods among the rural community. There is no escape from doing so since agriculture is location specific and the farms have to be linked to markets centrally located. A marketable surplus will have no outlet otherwise. Experts in this line have gone to the extent of saying that "If I could do only one thing in a region to spur agricultural development, I would build roads. If to this I could add a second, I would build more roads. And if to these I could add a third, I would build still more roads".¹ The point is well made, any way.

The road net work and their maintenance upto the town level is fairly satisfactory in the country. The weakest point is that of the rural roads. Gaps need to be filled in order to link (a) villages with each other (b) villages with sub and assembly market centres and (c) those centres linked with towns. This link-up and associated road development are necessary for the success of the marketing struc-

ture. In road construction there could be a compromise between cost, durability and ease of procurement. (a) and (b) type of roads could be built by Zila Parishads, with the help of contributions made by the market committees; (c) type roads will have to be made by the PWD. See Table below for the progress of rural roads programme. There is a long way to go.

TABLE 17
Rural Roads Programme—Accessibility of villages by Roads as on 31.3.1981

Population category	Total number of villages	No. of villages connected with		No. of villages still not so connected		Remarks
		All weather roads	Fair weather roads	All weather roads	Fair weather roads*	
1500 and above	69,224	10,334	13,949	28,890	18,003	*Information as on 31.3.78
1000—1500	56,587	23,244	9,816	33,343	21,822	
Less than 1000	4,65,881	91,588	69,062	34,7,530	2,74,645	
Category-detail	237	—	NA	—	NA	
NA						
Total	5,91,929	1,55,166	92,827	4,36,763	3,14,400	

Source : (i) Ministry of Rural Reconstruction Government of India.
(ii) Indian Agriculture in Brief 1982, 19th, Edition P. 107.

Note : The Sixth Plan document envisages provision of all weather road connection to all villages of over 1500 population, and of 50 per cent villages between 1000—1500 by 1990—Half of these villages so connected to be completed by March 1985. A long way to go still.

(B) *Marketing* To enable the farmers to go in for increased agricultural production under modernised technology, it is necessary that there should be arrangements for the marketing of his produce at incentive prices, making sure that the markets are within a reasonable distance of his fields and the approach to them is as easy and direct as can be. The farmer would also like to be satisfied that the price spread between him and the ultimate consumer is reduced and consumer products and agricultural inputs are made available to him at reasonable prices. He is conscious of the fact that he has a poor holding capacity and the trade is quite keen to indulge in malpractices.

In a fair deal to him the market place or produce collection centre should be available, to begin with, within 5 km distance. At these places there should be adequate facilities for grading, weighing and storage, and these places should be brought under regulation if that be not the case already. Regulated markets bring considerable benefits to the producer-seller by preventing malpractices such as unauthorised market charges, falsification of weights and measures. It

is necessary that each such market should be supervised by a duly constituted market committee which would ensure the observance of statutory rules and regulations by all concerned. These committees should give major representation to the growers. All the transactions of purchase and sale of notified agricultural commodities produced in the specified market area should be conducted within the regulated market only and not outside it. The other facilities or conditions governing these markets should be :

- (i) levy of a market fee not on *ad valorem* basis but on weight ;
- (ii) market area should be subdivision of tehsil/taluk or be coterminous with a block or part of a block ;
- (iii) each such market should have an adequate market yard and administrative block to accommodate officials of the market committee, market functionaries, post and telegraph office and bank etc.).
In addition, there should be a guest house for the farmers who could stay there overnight, if necessary.
- (iv) each market should have adequate storage/warehouse capacity for keeping the produce ;
- (v) the sale of produce at these markets should be by open auction or tender system as far as possible.

As far as possible, the farmers may operate as members through cooperative agricultural marketing societies so that they have the benefit of a good market facility without being subjected to the intricacies of market transactions. Such societies located in the market yard/place would obviate the need of private commission agents to that extent. Even otherwise the objective should be to phase out from the market the unnecessary intermediaries like brokers etc.

Market functionaries should be licenced—including traders and commission agents by the State Marketing Board/Authority. The weighing of produce should be done by the market committees and only duly weighed and graded produce should be handed over to the commission agents.

These regulated markets should also make available to the farmers all agricultural inputs there then, on time and at reasonable prices. They will thus save on return transport and avoid unnecessary waste of time. Similar arrangements could be made for the supply and service of farm machinery and implements—channelled through the primary cooperative marketing societies, state agro industries corporations and sale depots of private traders. The farmers' service societies could also run input depots for seed, fertilisers, insecticides and pesticides.

In the field of processing of agricultural commodities the monopoly of the private sector would need to be done away with. A chain of processing units could be set up in the cooperative sector, linked with the primary cooperative marketing societies for supply of raw materials.

Facilities for grading of agricultural produce would have to be strengthened, grading to be made compulsory.

In fact, all regulated markets should have facilities to grade all agricultural commodities.² See progress of setting up regulated markets in the table below :—

TABLE 18
Number of Regulated Markets

Sl. No.	State	As on 31.3.81 number of wholesale markets	As on 31.3.82		Total
			Principal markets	Sub markets	
1	Andhra P.	539	541	—	541
2	Assam	101	7	9	16
3	Bihar	443	134	466	600
4	Gujarat	283	121	162	283
5	Haryana	175	88	96	184
6	Himachal	21	9	31	40
7	J and K	—	—	—	—
8	Karnatak	319	113	210	323
9	Kerala	56	4	—	4
10	Madhya Pradesh	633	253	72	325
11	Maharashtra	571	226	351	577
12	Orissa	76	40	34	74
13	Punjab	476	120	186	306
14	Rajasthan	283	129	212	341
15	Tamil Nadu	220	218	31	249
16	U.P.	620	252	365	617
17	West Bengal	200	36	257	293
18	All India	5,161	2,303	2,489	4,792

Source : Indian Agriculture in Brief—19th Edition, 1982, p. 304.

Punjab

In the Punjab, the farmer to some extent suffered in the fifties since the marketing facilities did not keep pace with the needs. Agricultural production was steadily increasing but average area served by a regulated market was disproportionately large and the farmer faced a lot of difficulties. In its Fourth Plan, the Punjab state held that the normal standard for marketing facilities should be that each village is within only 7.5 km of a regulated market since a larger

distance would reduce the returns of the farmer. By 1980-81, each such market was serving only 132 villages and an average area of only 420 sq. km. Statistically the state had 120 regulated markets with 382 sub yards attached to them in addition.³ Ad hoc purchase centres were set up for rabi and kharif crops, depending on the crop prospects. In 1980-81 there were 603 purchase centres for kharif and 784 for rabi marketing season, compared with only 155 and 251 in the year 1971-72 respectively.⁴ There being a tremendous rise in market arrivals, the problem of congestion and overflow in the markets still remained. Facilities were inadequate; security arrangements were also lacking in the subyards.

Recently a need has been felt for covered market yards—instead of open as at present—to protect the grain against rain and sun. The State Marketing Board has already provided them in some markets. There are plenty of funds available with the Board, collected through a big market fee at the rate of Rs. 2 per cent, to extend this facility further.

As it is, the marketing of agricultural produce in the Punjab State is the best in India, even though it has not yet come upto the standards prescribed in the State Plans. Since the marketing of produce is concentrated in very short periods (hardly two months in each season twice a year) there is congestion, delays, wastages and even discontent among the farmers. Many facilities are still lacking there e.g. of driers, graders and processing units. The farmer would no doubt command better terms of trade if mechanical driers, sieves and graders were to be installed in every market, besides supplying these facilities at the village level through panchayats/cooperative societies as service on payment.

Now 98.47 per cent of villages in the state are linked with roads, though road maintenance is poor (1980-81). More village link roads and storage space would need to be provided, if Punjab agriculture is to maintain its dynamism, but whatever be the other physical constraints, assured markets at remunerative prices are an indispensable minimum.

“Marketing is the part and parcel of a modern productive process, the part at the end that gives point and purpose to all that has gone before. Benefits from mechanisation can be minimised if corresponding improvements are not made in the marketing system.”⁵

NOTES

1. Prof. A.W. Ashby, British Agricultural Economist, quoted by Sudhir Sen in his “A Richer Harvest”. p. 27.
2. Based on the abridged Report of the National Commission on Agriculture 1976. p. 577-80.
3. Statistical Abstract issued by ESA, Punjab, p. 172.
4. Statistical Abstract issued by ESA, Punjab, p. 172.
5. Leo E. Holman “Improving the Handling of Grain in Modern wholesale market”—The Ford Foundation New Delhi—1969-70. p. 1.

(xi) FARM MECHANISATION

To get the optimum benefits from new farm technology, based on Green Revolution, some sort of mechanisation of farm operations—pre and post harvest—is necessary for the simple reason that for double-cropping and multiple-cropping etc., the farmer is fighting against time and to be ready for the next sowing in time he must hasten his operations quicker than mere additional labour can do. Experience of Punjab shows that such mechanisation does not dislodge labour; instead, new jobs are found for the repair, maintenance and the running of machinery itself and at the same time any surplus labour is used up in seeing through the increased volume of farm operations as a result of the intensity of cultivation. Punjab, in fact is importing labour from states like Bihar and Rajasthan even UP. This type of mechanisation replaces bullocks and not human labour.

Prima facie, however, mechanisation on the farm is contrary to the interest of the abundant labour availability in the country. So the choice in favour of mechanisation must be very carefully made considering all aspects of labour availability and the interstate mobility of it. Machinery to be employed on the farm must raise production, should not be too costly (capital intensive) nor too difficult to operate and maintain, should yield tangible return, and lastly but importantly, it should not unnecessarily displace labour. The overall aim could, therefore, be to maximise production and employment.

There is also an obvious need for better farm implements. Such implements even if drawn by bullocks and better tools even if operated by hand could definitely add to efficiency and output. Improved ploughs could reduce the number of ploughings and yet provide a better seed bed. Timeliness of various operations is as important in agriculture as in industry, even more. Even power-driven machinery may be needed for more efficient and timely operations, more so to conserve moisture. Proper placement of seed and fertiliser can help better yields and improved drills can do the job well. Traditional harvesting of crop and its threshing manually is slow and wasteful. A lot of practical expertise is available in Punjab and Haryana in these matters. Many improved types of threshers and other implements have been evolved there, power operated and otherwise.

When multiple-cropping is resorted to, timeliness in planting, tillage and harvesting becomes a critical factor. It is seen through partly manually and partly mechanically. Then there is rush for preparing the seedbed for the next crop. If the holding is sizeable a tractor comes very useful—either self-owned or jointly/cooperatively owned or custom serviced etc. A farmer owning 6 ha of land can reduce cost by resorting to tractor power provided his cultivation intensity is 150 per cent.

Punjab, Haryana, UP (western) and Andhra have been leading in the use of tractors—even before the onset of the Green Revolution. "In 1966, Punjab and Haryana together accounted for 29 per cent of the 54000 tractors used in the country, though they accounted for less than 4 per cent of the country's population. In 1974 a study showed a very high and significant correlation between tractor use and the new hyv seeds."¹ In fact, the introduction of new seeds

encouraged the use of tractors for reasons indicated above in brief. The number of tractors in the country grew from 8500 in 1951 to 54000 in 1966 and 90000 in 1969 and nearly 5 lakhs by 1978-79.

The present installed capacity of tractor industry in the country is one lakh per annum—biggest in the world. 74,318 tractors were sold in 1983-84—tractor drawn implements besides.

It is not necessary that farms must be big enough to be able to make use of tractors. The example of Japan and Taiwan is worth emulating. "In both cases farms have been kept deliberately small; productivity has been built up with improved seeds, fertilisers and other inputs; machinery was devised and introduced with a good deal of thought and ingenuity to tackle peak loads, to ease bottlenecks to ensure timeliness in operation, to help precision cultivation. Mechanisation was promoted to improve yield and income".²

In large farms the introduction of tractors cuts out the cost of fodder and other costs for the year-round maintenance of bullocks used for a limited number of days in a year and, in the long run, proves to be cheaper and quicker in operations. Tractor technology has, infact, proved to be less expensive despite its capital intensive nature. If there be idle capacity, it can be hired out to the nearby small farmers on negotiated rates.

There is evidence to show that tractorised farms usually produce a higher output per unit of land. A large number of studies in Punjab show the tractor farms as having a higher level of cropping intensity than bullocks farms; the tractors solve the problem of time constraints involved in multiple cropping and encourage double-cropping as much.

For lack of awakening partly, and partly for lack of availability, the use of tractors has remained highly concentrated in the northern region—especially Delhi, Punjab, Haryana and Western UP ; these states have claimed more than 50 per cent of the tractors used in the country. There were 500,000 tractors by 1978-79. Currently, per annum addition to them is nearly one lakh.

NOTES

1. Biplab Das Gupta—"The New Agrarian Technology and India," opt cited—P. 96.
2. Dr. Sudhir Sen—"A Richer Harvest"—opt cited P 297.

- (6) AP Agricultural University, Hyderabad, 1965.
- (6) University of Agricultural Sciences, Bangalore, 1965.

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- (7) Mahatma Phule Krishi Vidyapeeth, Rahur (1969 (For Western Maharashtra)
- (8) Punjab Rao Krishi Vidyapeeth, Akola 1968-69 (For Nagpur Area).
- (9) Marathwada Agricultural University, Parbhani 1972.
- (10) Konkan Krishi Vidyapeeth, Dapoli (Maharashtra) 1972.
- (11) Assam Agricultural University, Jorhat 1970
- (12) Haryana Agricultural University, Hissar 1970
- (13) Tamil Nadu Agricultural University, Coimbatore 1971
- (14) Rajendra Agricultural University, Patna 1971
- (16) Kerala Agricultural University, Mannuthy 1972
- (16) Gujarat Agricultural University, Dantiwada 1972
- (17) Bidhan Chandra Krishi Vishwa Vidyalaya, Harin Ghata 1974
- (18) Chander Shekhar Azad University of Agriculture and Technology, Kanpur 1975
- (19) Narender Dev University of Agriculture and Technology, Faizabad UP. 1976
- (20) Himachal Pradesh Krishi Vishwa Vidyalaya, Palampur. 1978

Progress of Research in Crop Sciences—Some Aspects of

Main objective of the projects of research was to evolve highyielding, fertiliser-responsive varieties with inbuilt resistance to important pests and diseases and also to workout a package of practices for economic cultivation of these new varieties. Before making recommendations in favour of new highyielding varieties, tests were carried out in the farmers' fields with the cooperation of department of agriculture. Broad results are indicated below :-

- (i) Many hyvs have been evolved to suit different conditions in the country, for example in wheat, rice and cotton.
- (ii) These new hyvs have led to increase in intensity of cropping, making double and multiple cropping possible e.g., rice and wheat rotation in the northern states wheat and rice in West Bengal or jute, rice, wheat or jute, rice, potato rotation in eastern states.
- (iii) The cooperative indica-japonica hybridisation programme produced new varieties in some states but the outstanding example was 'Adt 27' produced in Tamil Nadu capable of a yield of 4 tonne/ha grain with intensive cultivation.
- (iv) JAYA and PADMA varieties of rice—crosses between Taichung Native 1 and T-141—were evolved in Dec. 1968 giving a yield far higher than IR-8. Some other area-specific hyvs of rice were also evolved.

- (v) Kalyan Sona wheat (from S-227), Sonalika (from S-308) 'Safed Lerma' from S-307, Chhoti Lerma from S 331 and Sharbati Sonora from Sonora 64—all hyv wheat varieties, were developed by IARI in cooperation with Agricultural Universities at Pant Nagar and Ludhiana out of the Mexican dwarf varieties supplied by Borlaug in 1963. Under high fertility and irrigated conditions, these varieties gave yields 2 to 2½ times those of tall Indian wheat varieties. Many other 'area specific' varieties were also evolved.
- (vi) Similar steps with success were taken to evolve hyvs of maize, millets, pulses, oilseeds, sugarcane, tuber crops and cotton etc.
- (vii) ICAR and agricultural universities carried out research on problems of soils, agronomy engineering, manures and fertilisers. Researches on soil salinity for example, standardised the techniques of reclamation of saline-alkaline soils in the Punjab, UP, AP and other states. Researches have been done on water management and soil salinity, use of saline water for crops, water management in high rainfall areas which have yielded good results.
- (viii) Irrigation facilities being limited in the country, major portion of the soil is under dry farming—a major factor in our agrarian economy. Research on dry land farming problems is a 'must', for example on problems of crop mixture and intercropping, water intake studies, efficient fertiliser use, water harvesting, run off collection, storage and its efficient use etc. Intensive research is going on at more than a score of our research centres; their work is properly coordinated.
- (ix) Similarly researches are carried out in the field of entomology, plant pathology and pesticides. Effort is to develop hyvs with built-in resistance to pests and diseases; location specific problems of pest and diseases are dealt with by the agricultural universities.

"The fact that occasional outbreaks of pest and diseases and epidemics have been contained and the Green Revolution has been sustained, is an adequate proof of the researches in plant protection".²

Sudhir Sen observed the following about the speed with which agricultural universities were started in this country in the 60s and 70s :—

"India's agriculture has been finally caught in the dynamics of the scientific age. There can be no more turning back. It is now destined to move forward despite adverse factors. The pace can be considerably quickened if the directions already set are unswervingly adhered to and the basic policies already laid down are unflinchingly carried out".³

Extension must keep pace with research. It is the conveyor-belt which delivers the results of scientific research in agriculture to the farmers. "Dynamic research and a ramshackle extension outfit donot pair well. The pace of future progress in India's agriculture will depend very largely on the rapidity with which this incongruity

is rectified. The burden of this important job is to be shared by the agricultural universities and the government/departmental extension agencies, including NES."

The NES personnel including the VLWs will need to be well trained in intensive scientific agriculture. The Directorate of Extension in the Ministry of Agriculture at the Centre has made sustained efforts so that professional agricultural extension, already established in 13 major states by 1983-84, not only maintained but also increased its pivotal role in agricultural production. It has provided infield guidance, arranged exchange of experts between the states and organised workshop and seminars at regional and national levels. The Directorate claims that

"the role of Training and Visit (T & V) System of extension is particularly perceptible in the introduction of new crops in nontraditional areas, introduction of new crop rotations and increasing the intensity of cropping. The large increase in area under soyabean in M.P., the extension of area under summer groundnut in Gujarat and Maharashtra——have been largely due to sustained extension efforts."⁴

The Directorate of Extension has also continued to organise various training programmes in order to improve professional competence of the extension functionaries. It has also provided guidance to state agriculture departments in planning, coordinating, implementing and evaluating training programmes for farmers, farm women and farm youth, to improve their knowledge and skill to impart training. The Extension Education Institutes at Anand in Gujarat, Rajender Nagar in AP and Nilokheri in Haryana have been meeting the increased need for training of field level extension officials. A net work of VLW Training Centres and Farmers' Training Centres continues to function in different states. Tours of thousands of farmers from agriculturally backward areas are also arranged to states where considerable progress has taken place in various fields of agriculture.

The agricultural universities have also to play their vital role in extension and extension education. The very concept of these universities is based on research, education and extension. The role of the Punjab Agricultural University in Green Revolution is described thus by PC Aggarwal, a perceptive observer :—

"Twice in the year the university organises Kisan Melas on the campus where farmers from all over the Punjab, and other states come in large numbers. The university virtually turns itself out on these occasions and allows the visiting farmers to see what is being done there. All the new varieties of plants are put on display together with full details about their merits and methods of cultivation. At the same time improved machines and animals are exhibited. Scientists explain their research findings and discuss them with the visiting farmers. "Formal question and answer sessions are organised where farmers can discuss specific problems with the scientists.

"During the nine years of its existence the University's 'scientists' have evolved a number of improved seeds, found ways to control plant and animal diseases, designed new machines and developed more efficient techniques of production.

Economists and other social scientists of the university have done a great deal of research on diffusion of innovations, communication patterns, marketing of crops, farm mechanisation and employment. Most of their research has been on current problems and it has led to significant improvements in all aspects of agriculture in the district and the state,

"Two important points need to be underlined about the contributions of the university. One is that for the first time in the recent history of India scientists have gained respectability in the eyes of the farmer. The latter have realised the value of scientific research. Farmers seem to understand that, in order to use modern technology effectively, they have to depend on the scientist. On many occasions farmers have spontaneously organised meetings to honour scientists. One can easily imagine the effect of such social recognition on the morale of an otherwise meagrely paid college professor. Several panchayat samities and zila parishads have voluntarily contributed money in support of the university's activities.

"A second notable point is the development of a close relationship between the University and the farmers. The University extends itself to the farmer through its distinctive teaching methods which require students to visit farms and homes and set up demonstration plots in the villages. Visits to the villages by the faculty members for research and discussion are also frequent. The farmers are drawn to the university through 'kisan melas', farm competitions, field days, demonstration centres, pure seed depots, discussion forums, specialised training courses for young farmers and special fruit preservation and crop husbandry courses for women. They also run their own services for soil and water testing, plant protection, artificial insemination, planning and planting orchards, veterinary treatment, custom hatching of pedigreed eggs, guidance on dairy production and pig keeping, agricultural information and broadcasting and lately an advisory service for designing and building farm houses, cattle and poultrysheds, grain stores and tubewells.

"By 1960-61, a strong base for development had been established so that when the IADP, the agricultural university and the hyv seed came in quick succession, agriculture was transformed."⁵

It is evident that the agricultural universities should play a vital role in pushing through the concept of Green Revolution in backward states like UP, Bihar, M.P. and Orissa etc.

NOTES

1. M.S. Randhawa— "History of the ICAR" —1979 p. 215
2. M.S. Randhawa— "History of the ICAR" 1979, p. 327
3. Sudhir Sen— "A Richer Harvest" 1974 Tata Mcgrawhill. p. 329.
4. Annual Report 1983-84. Deptt of Agricultural Cooperation, Govt. of India —p. 65.
5. Aggarwal, Partap C "The Green Revolution and Rural Labour" A study in Ludhiana pp. 117-120, quoted in M.S. Randhawa's "A History of the ICAR" (1929-79), New Delhi. pp. 234-239.

PART THREE

Impact of Green Revolution

In this Part there are four chapters showing the reaction of the states of Punjab, Haryana, UP and Bihar to the introduction of the Green Revolution. An attempt has been made to give a running narrative of the efforts made by them—or the lack of those efforts—to imbibe the new ideas/new technology and fructify them on the ground and with what results. Punjab had the infrastructural facilities largely available for the purpose; Haryana made quick efforts to create them after the formation of the new state; UP showed some success in its western region; Bihar drew a blank except in the last few years and so on. In such like narratives some repetitiveness of facts is inevitable but a quick run through the four chapters will make the point abundantly clear that states with clear vision political determination—and being of a manageable size physically and demographically—have been better able to gain from the new technology in material terms than those which were lacking in these 'basic'—socio-political—virtues.

To give a proper perspective to the relevant efforts made by these state governments, an attempt has been made in the following chapters to describe the food production there right from 1947, interalia, indicating the institutions like the NCAER which had carried out techno-economic studies of these states and made suggestions for the improvement of planning strategies and changes in the administrative set up etc.

Again, it has been brought out in these chapters, as necessary, where administrative strategies had shown lack of awareness, or there was a gap between planning and performance or, worse still, there was a lack of Leadership and guidance.

A broad pattern emerges from these accounts that progress takes place only when things are done with clarity and determination, in the right perspective, with full awareness and foresight, in a spirit of teamwork and understanding between the politician and the bureaucracy—the political boss setting the pace and giving the lead, at the end of the argument. The ultimate decision maker, of course, has to make the best of the available resources and the overall situation.

Impact on Punjab

With the partition of the country in 1947, sixteen districts of Punjab, with 55 per cent population and 62 per cent of area, remained with Pakistan—with 70 per cent canal irrigated land, including the well-known canal colonies of Lyallpur, Montgomery and Sargodha—the then granary of India. East Punjab, with 13 districts coming over to India was poor in land resources and irrigation though it had a bigger population density, having no waste crown lands; in the overall it was deficit in the production of foodgrains. Pre-independence Punjab had an excellent revenue and land records system, in which the rights of owners and tenants were accurately recorded. With the exchange of land records on both sides it was easy to verify the claims of the refugees.

Hindus and Sikh had left 6.7 m. acres of land in West Punjab out of which 4.3 m. acres were irrigated. As against this only 4.7 m. acres were available in East Punjab for allotment, out of which only 1.3 m. acres were irrigated. A cut in the allotment of land to refugees was inevitable. Innovations had to be made in the methodology of allotment, considering the differing nature of the soil in various districts on the eastern side (it was at this stage that the concept of "standard acre" was evolved). With cuts in allotted land, "there was inevitably a considerable levelling down of ownership of land at higher levels."¹

Dr. M.S. Randhawa holds that the modernisation of agriculture in Punjab started in 1950 with the rehabilitation of refugees; the partition of the country had given an opportunity for initiating schemes of agricultural development and rural renewal. Not only was a large number of land holdings consolidated in the process of allotment itself but new schemes like garden colonies, loans for sinking tubewells powered by electricity, loans for tractors etc., were introduced for the first time. The refugees in the true sense had spearheaded an agricultural revolution in the state. These refugee farmers, believing in hard work and dignity of labour, had done very

well in West Punjab side in pre-1947 India. Their achievements in the "bars" of Lyallpur, Montgomery and Sargodha were models of agricultural development.²

The refugee traders—Khattris and Aroras—also had shown a keen interest in entrepreneurship in the field of small industrial management and organisation. No wonder this combination of the two classes of refugees worked remarkably well in a short span of time. "In any cooperative joint endeavour the human element always plays a dominant role and this was one resource that was available in abundance to the Punjab that was formed in India after 1947".³

The revival of East Punjab and its progress and development, remarkable in the history of free India, is reminiscent of the reconstruction of Western Europe under the Marshall Plan after the Second World War, though on a different plane. The refugees from West Punjab were used to comparatively advanced (then) ways of agriculture and they took no time in creating the same sort of environment and productivity, with their spirit of innovative labour on this side of the border. Their performance was really even more creditable than that of Western Europe and would need to be retold by some expert.

The new state of Punjab started with the task of augmenting agricultural production in a systematic manner. The task, uphill though it seemed on the face of it, with scattered and small holdings, very little or no irrigation, lack of capital resources, unproductivity of the soil and many other handicaps, was made easier by the efforts of an enlightened and imaginative government, especially from the early fifties when the late Pratap Singh Kairon became first the Development Minister (1952) and later the Chief Minister (1956-64) of the state. Kairon went through the multifarious phases and needs of development in the field of agriculture in right earnest, and with a rare clarity of vision, doing requisite things at the right time in keeping with the need of the situation and making various facilities and inputs available to the farmers so that they could get on with the job with an adequate seriousness of purpose. Infact, Punjab owes much of its prosperity to the unusual stability and purposefulness imparted to its government by the great leader Kairon.

First of all, a systematic programme of agricultural development of the state was taken up on a massive scale in the shape of the Grow More Food (GMF) Schemes, to be followed up with a programme of (compulsory by law) consolidation of land holdings and augmentation of canal irrigation—major, medium and minor schemes—the latter by the exploitation of under-ground water in the shape of tube-wells. Under the GMF, lakhs of uncultivated acres were reclaimed and brought under the plough. The consolidation operations were imaginative in their concept, coverage and implementation because, apart from bringing the fragmented holdings of small farmers together, ample land was left apart to be used for common purposes like roads, school and hospital buildings, right in the beginning, that is before fresh allotments of land were made. Schemes for the supply of improved seeds, chemical fertilisers, farm machinery, insecticides and pesticides, regulated marketing system, link roads, cooperative net work etc., were taken up gradually so as to build an infrastructure essential for increasing agricultural production.

It was not the case that these progressive measures were adopted all at once or one taken up after the other was completed. These were taken in hand as the needed gap was felt in the overall scheme of things. Since the vision was clear towards a politico social objective, that Punjab agriculture must be quickly developed to the utmost, the requisite steps to achieve this objective were also well understood by the ruling leadership and this class, under the inspiration of Kairon, was competent and purposeful enough to lead the bureaucracy in the right direction, to enable the latter to persuade the common man in the field to realise that the adoption of various progressive measures was needed in the interest of their own economic well-being and the overall prosperity of the state. The basics were tackled first, as resources became available under the Plans or outside. The irrigation projects naturally had the first priority but, side by side, consolidation operations went on in right earnest from 1952 to 1968, both being long gestation programmes. As the agricultural economy developed and the people became conscious of what was required for hastening towards the economic goal, other concomitant measures/schemes were taken up as soon as possible and pursued with vigour on the ground, not allowing them to enter a routine course but seeing them come to a successful end.

Being a small state of just about a dozen districts (13 to be exact), it was a great advantage to be able to oversee how things were progressing. The political leaders at the helm of the government knew their officers well who, in turn, understood well the capabilities and handicaps of their field staff; the technocrats were duly respected for their expertise and given full support in ensuring a successful implementation of projects on the ground. Once there is a clear grasp of the overall objectives between political bosses and the implementing bureaucracy—and there is a mutual respect for each other also—the work of development moves smoothly and progress is guaranteed. Luckily the 15 years' dominance of the state developmental scene by the towering personality of Kairon created a favorable climate in the state in which progress was a 'must'. Punjab had to move on in the economic sphere, and it did so relentlessly, till it came to attain a position of predominance in the entire country.

Punjab made full use of the research facilities available in the country and tried to modify its developmental approach and outlook in keeping with the observations made by neutral scientific bodies. It commissioned a technoeconomic survey of the state by the NCAER whose report was received in 1959-60. The NCAER observed that, compared to some other states, Punjab had progressed rather quickly in the provision of irrigation facilities, improved seeds and fertilisers; its hard-working farmers with a progressive bent of mind were also quick to adopt improved cultural practices; the ingenuity of the Punjabi worker was a great asset to the economy. 'Agricultural production grew but, nevertheless, Punjab prosperity, as it is, is characterised by poor cropping pattern, resulting in output of low value,'⁴ said the NCAER.

Hardwork, progressive outlook, bigger farms, better irrigation facilities, a propensity for the use of improved agricultural machinery and implements and a relatively well-developed animal husbandry—these mainly accounted for the higher income levels of the Punjab agriculturist. The yields of all principal crops in the

state were higher than the Indian average. And yet there was a considerable scope for increasing the area under irrigation, double cropping, use of manures and fertilisers. The Report commented that

"all these developments will no doubt occur in the future but the speed at which they will occur will depend a great deal on the response of the agriculturist to progressive techniques of farming. It is here that the dynamism of the Punjabi farmer comes as a great asset and almost certainly assures a relatively rapid rate of growth."⁵

The rate of growth of agriculture in Punjab since 1951 had been striking. The first Plan targets were exceeded and those of the Second Plan already achieved. The rate of growth of the output of principal crops was substantially higher in the Punjab than in all India during the First Plan. For example, for foodgrains it was 47 per cent, cotton 95 per cent, oilseeds 37 per cent sugar cane 26 per cent as against 32 per cent, 37 per cent, 11 per cent and 7 per cent respectively in all India. These growth rates continued undiminished throughout the Second Plan.

Beginning on Independence as a food deficit state, importing 37,000 tons of foodgrains per year, Punjab had progressively increased its production and become a surplus state. By 1959-60, the exportable surplus of grain was nearly one million tons. The average yield per acre of nearly all the principal crops grown here was higher than the all-India average. In that year, with only 6.2 per cent of the all India gross cropped area, Punjab produced 7.5 per cent of the country's output of foodgrains. The factors favouring its agriculture then were a superior land-man ratio, a good irrigation system and the dynamism of the farmer in the use of the relatively better techniques. The negative forces were floods, water logging, soil erosion, salinity and soil alkalinity.

Haryana region was still a part of the Punjab state. The cropping pattern there in the first 10-15 years was inferior for lack of irrigation water in that region. Crops like wheat, gram, jowar and bajra were low value crops compared with wheat and rice in the Punjab region. Though the value of output per acre in Punjab was low, the percapita productivity in money terms was high: Punjab had Rs. 181/- as compared with India's Rs. 162. This was due to larger net sown area per head of agricultural population.

In short, while the physical productivity of land was high, it was far from the maximum possible. Secondly, it presented a picture of high productivity percapita but still low productivity per acre, compared with the land potential.

Let us see the progress in some detail. In 1950-51 the net sown area in the Punjab was 16.10 m. acres; in 1959-60 it was 18.48 m. acres; gross irrigated area increased from 7.43 m. acres to 9.51 m. acres, double cropped area from 3.1 m. acres to 5.5 m. acres in the same period. Fertiliser use increased from 4,000 Tons to 36,000 Tons.

Thus in 1958-59, about 30 per cent of the sown area received irrigation—2/3 by canals and 1/3 by wells (2,30,933 wells and 5,052 tubewells). Crop intensity in the state was 130 as compared with 114 in all India (1955-56). Punjab had the

largest coverage under improved seeds viz., wheat 86 per cent, paddy 70 per cent, cotton 91 per cent sugarcane 95 per cent. Improved agricultural implements were commonly used; with only 5.6 per cent of the net sown area in the country, Punjab had 21 per cent of iron ploughs, 12 per cent of electric pumps for tubewells and 18 per cent of tractors in the country (1956). With irrigation growing, the farmer was changing over to superior crops like American cotton and potatoes and hybrid maize. Consolidation of holdings was already well advanced—60 per cent of the total cultivated area had been done. The state had a better marketing organisation—every market town served 106 villages (compared with India's 180) and 239 sq. miles (compared with India's 390 sq. miles). Road transport was also well developed.⁷

The NCAER peeped into the possibilities of the next decade 1961-71 and suggested reclamation of a big chunk of land, viz. 3,50,000 acres, prescribing that a land use survey should be carried out to determine its full potential. Most of the reclaimable land consisted of public lands scattered over the state which could either be long leased out or sold to farmers. Cost of reclamation was estimated at Rs. 100 per acre and the target of reclamation in 10 years could easily be one million acres.

With regard to irrigation in 1961-71, the NCAER felt that, apart from canals, there was a very good scope for developing irrigation from groundwater in the state to cover areas lying in the Indus belt. It suggested open lined wells 50' deep and 25' diameter in canal command areas as antiwater-logging measure and sinking of shallow tubewells, 80' to 100' in depth, where water table was high in canal command areas at a cost of Rs. 20,000/- each able to irrigate 100 acres. Deep tubewells were also suggested—a programme of Rs. 30 crores to cover 1.5 m. acres of irrigation.

Other anti-waterlogging measures were also suggested for dealing with 7-9 m. acres of land, including 2 m. acres of irrigated land, measures like lining of canals to prevent seepage and percolation, provision of adequate drainage, diversion of nullahs and khuds into rivers and channels and provision of storm water drains. In passing it was mentioned that canal irrigation often resulted in excessive irrigation as the quantity of water had no bearing to its cost and the cultivator had no control over its supply nor its timing. This resulted in waterlogging on a large scale. It was felt that optimum use of water would raise crop yields by 25 per cent at least and enable existing resources to irrigate an additional one to one and a half million acres.

The NCAER suggested means to evolve and produce improved seeds with better performance and agronomic qualities—in itself a continuous and never ending process though. Regarding fertiliser and soil management, the Report talked of larger use of chemical fertilisers and green manuring to enrich the soil for the introduction of a second crop. The fertiliser consumption potential in the irrigated areas alone was considered to be about 4,00,000 tons of nitrogen and 50,000 tons of ammonium sulphate and superphosphate. By way of improved cultural practices, Japanese modes of rice cultivation, with adequate irrigation and manuring, cultivation of sugarcane in trenches, sowing of millets and gram in lines, selection of disease free seeds etc., were suggested. Emphasis on control and treatment of plant diseases was also laid. In regard to marketing of agricultural produce, the enforce-

ment of regulation more strictly was recommended and the grading and standardisation of principal commodities emphasised.

The NCAER visualised that in all areas where either irrigation was stabilised or new irrigation was created, the cropping pattern would naturally move upwards in terms of high-value crops. For example, land under coarse grains may gradually shift over to gram-cum-wheat or only wheat. As land was reclaimed, fodder crops may be grown there and the existing irrigated land put under high value crops. With improvement in techniques of cultivation, and other developmental measures, the cropping pattern may shift over mainly to food (rice and wheat) and cash crops.

The Report estimated that between 1961 and 1971, whereas the area under foodgrains may increase from 17.99 m. acres to 18.56 m. acres, the production may go up from 6.2 m.t. to 10 m.t. viz., an increase of 60 per cent. And further

"Taking the population of Punjab at 24.84 million in 1971, as estimated by the Central Statistical Organisation, and a consumption level of 18 oz. of foodgrains per day per adult, total consumption requirements of foodgrains in the state would be 6.3 m.t. This will leave a surplus of 3.7 mt. for export. It will be seen that the exportable surplus will roughly treble during 1961-71. In addition the output of non food crops would also increase substantially."⁸

In actual fact, though Haryana was separated from Punjab in October 1966 as a new state of the Union, between the two of them the total rice and wheat production alone in 1971-72 was 10.2 m.t. and procurement therefrom was 4.3 m.t.⁹ The NCAER's forecast was exceeded mainly because, inter alia,

- (i) the Green Revolution had hit the Punjab Haryana region in 1965-66 onwards :
- (ii) the backward region of Haryana, as a separate state from November 1966, had tried to make up the developmental gaps in quick quantum jumps following the Punjab pattern; and
- (iii) Punjab itself made strides in the field of productivity, as never before, with a mission and enthusiasm, to solve the country's food problem;
- (iv) in the Punjab state and later on in Haryana, all steps connected with agricultural production took a logical course; things were never allowed to drift. The authorities had full control over the situation throughout.

The dynamism of growth shown by Punjab's agriculture had few parallels even if we reckon only the pre Green Revolution period viz., the period of the first three Five Year Plans. The production of major crops in the state had increased significantly during the first two plans, though a major contribution to increased production had come from extension in acreage. Comparatively low contribution was

made by increase in productivity—mainly due to low multiple cropping. Major contribution to increased foodgrains production in Punjab during 1951-52 to 1963-64 came through

(i) expansion in acreage	50.55%
(ii) yield variation	11.67%
(iii) changes in cropping pattern	38.25%
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	100.47

In 1947 it could not possibly be predicted that Punjab would make such rapid progress in agricultural production. With administration almost paralysed in the aftermath of the partition of the country, it was a miracle that the economy itself could be put on the rails again. Some believe even to this day that this crisis and its handling were mainly responsible for whatever Punjab is today. In a way true. Under the able guidance and iron hand of Partap Singh Kairon, Punjab made progress almost unprecedented. Apart from re-settlement of refugees and the consolidation of land holdings, it was realised at the very outset that the real hope lay in intensive cultivation, greater irrigation and greater use of fertilisers and many more crops from the same land in one year. Bhakra Dam and the Nangal Fertiliser brought about a rapid change in rural society. With the Irrigation water reaching the fields of say Hissar district, a cultural revolution occurred there. In Ludhiana district, with the Punjab Agricultural University coming in and the introduction of the IADP, the productivity of the farmers rose manifold as they adopted many improved agricultural practices and implements. The extension agencies went round with messages of greater use of chemical fertilisers and pumping sets. By 1965, these articles became in short supply; vital changes were taking place in outlook and application of new techniques. Application of chemical fertilisers alone shot up from 27,812 tonnes in 1956-57 to 3,02,375 tonnes in 1964-65. In irrigation, which is critical to high levels of agricultural output, almost all the increases in water supply—except that from Bhakra and Sirhind/Western Jamuna Canals, came from ground-water resources. The change in land utilisation and cropping pattern was materially affected by the rapid introduction of tubewells; their number in 1956-57 was 4799; it increased to 29,684 in 1964-65, mainly private owned. There were 13,868 tractors in use by 1964.

The greatest factor in bringing about this change was the application of science and technology to agriculture. With electricity coming to villages, tubewells and pumping sets multiplied; mechanisation of agriculture, with tractors and threshers, became common. Introduction of hybrid maize seed, improved wheat varieties and Japanese paddy—all these were accompanied by higher consumption of fertilisers. The technology variables in agriculture “were allowing farmers to push out to higher output levels along the traditional production function and secondly technology allowed shifts to newer, higher yielding and more efficient production functions.”¹⁰

Simultaneously, apart from consolidation of land, another very vital change

had taken place in the state mainly arising from the fact of refugee resettlement of land. The owner cultivated area in 1957 was about 2/3 of the total cultivated area, as compared with about half in 1952, while the land cultivated by tenants had fallen to 32.5 per cent in 1957 compared with 47 per cent in 1952. "The increase in area under owner cultivation was accounted for by conferment of proprietary rights on occupancy tenants, a higher level of prices, mechanisation of agriculture by large holders of land and some extension of cooperation in farming. The post Independence agrarian reform acts, resulting in granting security to tenants at will and lowering of rents, have further contributed to this tendency."¹¹

From 1950-51, the year when planning started in India, the production of foodgrains in the country increased from a level of 51 m.t. to 101 m.t. in 1973-74—having touched 108 m.t. in 1970-71—and then to 125 m.t. in 1982-83, 150 m.t. in 1983-84 and a couple of tonnes more or less in 1984-85. The present state of Punjab created in Nov. 1966 had a food-production level of 42.17 lakh metric tonnes; it jumped by leaps and bounds to 77.24 lakh T in 1972-73, 88.27 lakh T in 1975-76, 119.06 lakh T in 1979-80, 133.06 lakh T in 1981-82 and then to 141.70 lakh T in 1982-83. Target for 1984-85 was 145 lakh T. All along it showed a steady and stable production, mostly gaining in per hectare yields of wheat and rice by the use of modern techniques of cultivation, including the components of the Green Revolution since its inception. Wheat touched 3000 kg/ha in 1982-83 and rice went beyond to 3144 kg/ha. This yield represents the highest productivity in the country. It is because of the high per hectare yields that Punjab generated an appreciable surplus of foodgrains which it contributed to the Central Pool for public distribution. Currently Punjab has been procuring between 8 to 10 million tonnes of foodgrains every year of which more than 95 per cent goes to the central pool. In the summer of 1985, out of more than 8 m.t. of wheat procurement, 5 m.t. came from Punjab alone. Similarly for rice. The coarse grains move freely outside the state on trade account in addition.

The pre Nov. 1966 Punjab was also surplus in foodgrains but its overall performance stood reduced in statistical terms because of the comparative backwardness of Haryana and the hilly regions. In spite of that Punjab was even then on top in India in peracre productivity and its net contribution to the central pool. All this was due to increasing irrigation, adoption of improved seeds, increasing use of chemical fertilisers, sinking of groundwater tubewells, farmers turning towards mechanisation—and to cap it all, with all lands consolidated, more or less, and lastly, the IADP making such a big success in Ludhiana district of the state. With all these performances to its credit it was no wonder that the Punjab state responded to the impact of the Green Revolution in a big way and with open arms from its very beginning in the country; one can put 1965-66 roughly as the starting year of that revolution. See Table 19 for comparative contribution to the central pool.

In a nut shell, Punjab gave an excellent account of its initiative, adaptiveness, absorption capacity and ultimate performance by improving its per hectare productivity in wheat and rice, plus coverage of maximum land under these foodgrains. Such an improvement would require a package of policy decisions by the Government and a new technology adoption through an efficient system of extension

TABLE 19
Comparative net Contribution of Foodgrains to Central Pool

<i>Procurement</i>	<i>Six states compared</i> (In '000 Tonnes)					
<i>Year</i>	<i>Punjab</i>	<i>Haryana</i>	<i>UP</i>	<i>Bihar</i>	<i>MP</i>	<i>AP</i>
1979-80	6925	2293	2628	100	423	1051
1980-81	6577	1565	602	9	98	492
1981-82	6286	1813	2091	78	519	693
1982-83	8057	1577	1939	15	257	1627
1983-84	8459	2049	2249	45	394	1565
1984-85	9228	2765	3207	51	428	1115
Issue ex. PDS (81-85)	1006	603	3444	2829	1704	3705

- Source :* (i) Bulletin of Food Statistics, 1983-84 pp. 76-89.
(ii) Figures circulated by FCI on a Seminar on Food Security in New Delhi, April 1985.
(iii) PDS stands for public distribution system.

services to the farmers. It goes to the credit of the state government that it identified the basic needs of the farmers under the new challenge and took many far reaching decisions which created a base-a reliable infrastructure-on which modern agriculture could flourish. It may be noted here with pride and satisfaction that the Government's policy decisions were not taken all at the same time—as if the political leaders had some esoteric revelations to that effect or had listened to an economic dissertation from theoreticians of the Green Revolution—but they had started boldly with an open mind, going logically from one decision to another as the situation demanded and as the priorities emerged on the ground, consistent with the resources available and the proven optimum capabilities of their farmers. It will, perhaps, be an interesting exercise to pen down the exact dates, and the “rationale” perceived at the time, of each individual decision and precisely when and where the Chief Minister in position or his Cabinet gave his decision and direction in favour of steps like cent per cent rural electrification, rural road construction and linkages or relaxation of credit facilities for private tubewell construction etc. This exercise would require a lot of time and patience; original files and cabinet memoranda will have to be studied; but the exercise will be well worth undertaking to draw useful procedural lessons. Here, even at the risk of repetition, let us state a few of the infrastructural measures adopted by the Government :

- (i) Consolidation of landholdings was an ace decision taken in 1951 since fragmented holdings donot permit proper application of farmer's attention

to his job in the field nor do they allow quick exploitation of ground-water nor adoption of modern techniques of agriculture.

- (ii) Various measures were adopted to help the farmers in the installation of a large number of tubewells of their own for which loans were arranged; measures like boring drills, suitable credit/loans through State Land Mortgage Banks etc., were arranged.
- (iii) Priority for rural electrification, particularly for energisation of tubewells. fixation of flat rates for power consumption by tubewells was a great incentive for their installation. In 1966-67 there were only 74,586 individual tubewells in the state but by 1975-76 their number had shot up to 4,50,000. Be it noted that emphasis was more on private owned small tubewells adequate for irrigating 30 to 40 acres of land and not so much on the state owned big tubewells meant to augment canal water and for reducing the watertable in water logged areas of the state. That was a separate exercise, though. Earlier on, a 'warabandi' of power supply to tubewells was adopted by the State Electricity Board, to ensure that the tubewells got their share of power at specified, pre announced times, instead of suffering from low voltage or sudden power cuts. In result irrigated area jumped from 31.36 lakh ha to 37.69 lakh ha in the same period of 10 years. The farmers had irrigation at will and were, therefore, able to control the timing of agricultural operations. See below progress of irrigation in the four states of Punjab, Haryana, UP and Bihar.

TABLE 20
Irrigation Potential and its Utilisation (4 States)

(In '000 ha)

State	Type of Irrigation	Ultimate Potential	Utilisation			
			1979-80	1980-81	1981-82	1982-83
Punjab	M & M	3000	1084	1113	1136	1168
	Minor	3550	2914	2956	3001	3041
	Total	6550	3998	4069	4137	4209
Haryana	M & M	2000	1194	1222	1243	1252
	Minor	1550	1257	1292	1333	1375
	Total	3550	2451	2514	2576	2627
UP	M & M	12500	2398	2459	3054	3286
	Minor	13200	8840	4595	10270	10913
	Total	25700	11229	12054	13324	14199
Bihar	M & M	6500	1316	1396	1480	1550
	Minor	5900	2335	2464	2624	2785
	Total	12400	3651	3860	4104	4335

Source :— Indian Agriculture in Brief 19th Ed. 1982. pp. 196-199.

- (iv) The new hyv seeds needed higher irrigation as well as higher doses of fertilisers for exploiting inherent potential of high yields. Supplies were arranged accordingly and in time.
- (v) The Government strengthened the cooperative structure in the state; crop (cooperative) loan system was streamlined. The 1970-71 cooperative credit level of Rs. 28.31 crores increased to Rs. 230 crores in 1981-82 and Rs. 321 crores in 1982-83.
- (vi) The state had developed a well-organised marketing system having 105 regulated markets in 1975, the number of which had increased to 476 in 1981-82. Huge amounts collected as marketing fee were used for development of agricultural infrastructure like link roads, market yard facilities for farmers' lodging in the market areas, subsidy on fertilisers and pesticides etc. This was the only state where all rural areas were covered by a regulated marketing system. (Haryana soon followed this pattern).
- (vii) Green Revolution and the increasing productivity in land ushered in quick mechanisation of operations. The number of tractors, harvester combines, threshers, improved implements, electric motors, diesel engines, pumping sets etc., had increased manifold. Mechanisation of agriculture, particularly tractorisation, had made the greatest progress in the Punjab state.
- (viii) Supply of hyv wheat and paddy seeds was very efficiently organised, keeping its quality and purity in view.
- (ix) IADP experiment was a big success in Ludhiana district in the pre Green Revolution period. It was extended to other districts by stages. This led to a big increase in production.

All these and other steps gave an unprecedented spurt to wheat production which rose from a level of 19.16 lakh T in 1965-66 to 51.45 lakh T in 1970-71 and 85.53 lakh T, in 1981-82 crossing 92 lakh T in 1984-1985. Per hectare productivity also increased from 1238 kg to 2400 kg in 1975-76 and then to 2932 kg in 1981-82, crossing 3000 KG in 1984-85. This was remarkable achievement considering the all India average of 1696 kg/ha in 1981-82

Punjab was not a rice growing state but, with the introduction of hyv seeds and creation of irrigation facilities handily available, the farmers adopted the new rice production technology including advancing the sowing time of new seeds by one month. The production of this high value cash crop rose from 2.93 lakh T in 1965-66 to 9.20 in 1971-72, 11 in 1975-76 and then to 37.11 lakh T in 1981-82 and 10 lakh T in 1983-84. Similar productivity also rose, becoming the highest in the country, viz., 1000 kg/ha in 1965-66, 2400 kg/ha in 1975-76 and 2957 kg/ha in 1981-82, crossing 3000 kg in 1983-84 compared with all India 1317 kg/ha in the year 1981-82. [According to newspaper reports Punjab produced 100 lakh Tonnes of wheat and more, 10 lakh Tonnes of rice in 1984-85 crop year. Cropping intensity in the state had improved from 121.9 per cent to 167 per cent in 1984-85].

This spurt in food grains production in the state threw up a very big marketed

surplus which was efficiently mopped up at support prices by the Food Corporation of India to form the bulk of its Central Pool of grain, to run its public distribution system. Besides, it led to diversification of occupations, giving additional employment opportunities to the rural population, opening up of workshops in rural area for repair and maintenance of mechanical tools and implements connected with modernised agriculture, employing a large number of mechanics, technicians, electricians, operators etc., besides labour, to handle the surplus produce in the field and in the market.

Two factors which very vitally helped in augmenting agricultural production in this period were rural link road net work in the state and the creation of irrigation facilities all over.

First the Link Roads ; In the Punjab of 1966 there were 6370 km long metalled roads. A spurt came in 1970 when a length of 10118 km was reached. It is said that the then Chief Minister S. Lachhman Singh asked a benefactor for advice regarding economic development which could create an impression on the Punjabi mind. The advice was

"You put maximum resources in constructing village link roads. Simply because a village is separated from a main metalled road by a couple of miles of kacha road it remains backward. Children find it difficult to go to school. Farmers cannot market their produce with ease and they cannot buy agricultural inputs to improve their farming. If you construct these link roads you will see rapid transformation of these villages. Their agriculture will improve and their entire economy would change."¹²

By the end of 1975 Punjab had metalled roads 21,370 km in length. Very soon there was no village which was not accessible by road. This was one of the radical steps towards economic prosperity. The over all position by the end of the Fifth Five Year Plan was

	(1979-80)
National Highways	961 in kms
State Highway	1,900
Major district roads	2,100
Other district roads	2,379
Village road	23,520
	<hr/>
Total	30,860

The provision in the Sixth Plan was to include widening and strengthening of existing roads, construction of bridges, rural roads, improvement of roads within municipal limits and construction of by passes to help smooth traffic.

Two-about Irrigation Development

Punjab is the foremost state in the country to construct extensive irrigation works to support its agriculture. They say the greater part of reputation that India has gained with regard to irrigation is due to it. Irrigation is the greatest input in modern agricultural production and in the recent couple of decades emphasis has shifted from protective irrigation to intensive irrigation for maximising food production. Besides the three rivers to help provide irrigation water the state has a vast expanse of groundwater—a reservoir which is profusely recharged annually during the monsoons.

Inheriting a very small portion of the huge canal network of the pre-Independence Punjab, as stated already, the gap was made up with new schemes like Bhakra Nangal Project, Harike Project, Madhopur-Beas link, remodelling of Rupar and Madhopur headworks of Sirhind and UBDC canals, the Beas-Sutlej link and the Pong Dam at Talwara. Existing channels were extended and new ones constructed in the UBDC; the surplus waters of the Ravi were transferred to the Beas to the extent of 286 million cu. metres.

The new Bhakra canal system has changed the face of the parched lands in Punjab, Haryana and Rajasthan. The Sirhind and Ferozepur feeders, taking off at Harike, are larger feeder channels which provide alternative arrangements of feeding the Eastern and Bikaner canals from the Ferozepur Headworks.

Due to heavy floods and extensive irrigation in some parts there were 3 million acres of cultivated land in Punjab which were waterlogged—causing an annual production loss of Rs. 10 crores. The problem was solved on a war footing. Flood protection embankments were undertaken in all the Punjab rivers to prevent floods. A net work of drainage channels was constructed throughout the state to remove drainage congestion and waterlogging. Every bit of cultivable land was to be saved.

Another land mark in 1973 was the canalisation of the Sutlej River between Ropar and Harike, bringing out 2 lakh acres of fertile land from the river bed and put under agriculture. Again in 1975 flood protection embankments were to be constructed in the shape of 32' wide metalled roads on top and a 100' wide belt of trees all along the embankments on the Punjab rivers—a unique project of 700 Kms length. In the case of Sutlej and Beas rivers it was their local run off water from which protection was sought by these embankments, their major monsoon water having been caught in the Bhakra and Pong dams upstream respectively. A small state like the Punjab must look after all its natural resources very carefully and put them to optimum use. The way had been opened by the Green Revolution techniques and requirements.

Fertiliser Consumption

As agricultural production went up under the new technology/Green Revolution the use of chemical fertilisers was also intensified. The increase was reflected as under :

1955-56	27,812	metric tonnes
1964-65	46,000	metric tonnes
1979-80	6,86,000	metric tonnes
1980-81	7,62,000	metric tonnes
1981-82	8,13,000	metric tonnes
1982-83	8,92,000	metric tonnes
1983-84	9,60,000	metric tonnes
1984-85		more than one million T.

Punjab had increased per hectare productivity from 1000 kg to 2500 kg between 1961 and 1982-83. Per hectare consumption of fertilisers had increased to 121 kg in 1981—crossing 150 kg 1983-84.

“Fertiliser consumption and agricultural productivity showed linear trend in Punjab. A single point strategy for increasing production emerges to be fertilisers besides irrigation.”¹³

Let us put the Green Revolution technology in a crucible. It consisted of the following components which Punjab adopted in full measure and in correct sequence :-

(i) *Biological technology* brought in Lerma Rojo wheat seed in 1965 which was subjected to adaptive research in the Punjab Agricultural University at Ludhiana. Kalyan Sona, P.V. 18 etc., were evolved removing the defects relating to colour, size, gluten content etc. Similarly with rice IR8 in 1968, followed by Jaya 1971 H.M.95, RR 106, IR 103 etc., having long slender grain.

(ii) *Hydrological Technology* with hyv seed, key factor for success was irrigation which increased with the installation of tubewells, more than 6 lakhs by 1980-81, starting with only 25,000 in 1966. Irrigated area which was only 19.1 per cent in 1965-66, became 80.7 per cent in 1980-81.

(iii) *Chemical Technology* with increase in fertiliser consumption to which hyv seeds are very responsive. It increased to 7.62 lakh T in 1980-81 compared with 46,000 T. in 1965-66 and crossing one million tonne mark in 1981. To meet the problem of weeds, pests and insects, concentrated pesticides and insecticides were used as control measures.

(iv) *Mechanical Technology*—Time was of the essence, with biological advances in seed and chemicals. Successful modern farming required things done in time. Mechanisation of harvesting, threshing and transport operations was necessary, to be in time for the next cultivation, in the shape of combines, threshers and tractors.

(v) *Market and Storage Technology* : Remunerative prices (fixed by APC), paid to the farmers through price support purchases by the FCI acted as a great incentive to the farmer for modernising his agriculture and augmenting production through new technology. Improved farm practices are price responsive. Adequate storage is a necessary concomitant of market technology—provided by the FCI, Markfed, State warehousing Corporation and the Cooperatives etc.

(vi) *Easy Credit Technology* for purchase of inputs like seeds, fertilisers on short term loans and purchase of tractors etc., as medium term loans, sinking of

tubewells on long term basis and so no. Provision of infrastructure like power, diesel supply, fertilisers and seed depots, repair and maintenance workshops, extension services, research—all these are necessary for the success of modernised agriculture.

According to Dr. M.S. Swaminathan

“Efficient supply of quality inputs like fertilisers/pesticides, insecticides and weedicides and hyv seeds through the institutional agencies has created the proper environment for the exploitation of biological technology to the fullest extent. Supply of credit on easy terms for the purchase of these inputs and sinking of tubewells and purchase of pumping sets and other improved agricultural implements helped the adoption of new technology. The state government policy to supply electricity at flat rates and also liberal power connections for energising the tubewells ensured the adoption of the seed-fertiliser innovation. Massive procurement operations by the government agencies protected the farmer from exploitation by the trader. Construction of village roads helped him to bring his produce to the procurement centres without any inconvenience. Extension services provided by the state agencies psychologically prepared the farmer for the acceptance of technology.”¹⁴

The State of Punjab was able to make remarkable advances in crop production after the release of hyv dwarf wheat/rice varieties not only because the Punjabi farmer was so very quick on the uptake of new technology but also because the state administration provided to him all the facilities in the shape of supplies and services, in time, and put in the best administrative effort to give him full infrastructural support in adequate measure. The state in short, already possessed the four substrata requirements, essential for new technology to find widespread adoption, viz., owner cultivation, land consolidation, rural communications including marketing organisation and rural electrification, in fair measure. It was no surprise that Punjab became the spearhead of the Green Revolution in India and transformed its relatively advanced though still traditional agrarian economy with “most pervasive forces” like

- (i) the use of hyv seeds;
- (ii) improvement in and utilisation of irrigation facilities for intensive agriculture;
- (iii) use of optimum quantity of chemical fertilisers;
- (iv) application of pest control measures;
- (v) multiple cropping;
- (vi) soil and water management and conservation measures;
- (vii) development of infrastructural agricultural services;
- (viii) adoption of agricultural pricing and marketing measures in a regulated institutionalised form;
- (ix) agricultural extension programmes for the training and education of farmers;
- (x) emphasis on research and its application;
- (xi) adoption of IADP/IAAP programmes successfully.

The state of Punjab made quick strides towards progress because the government and the administration were so responsive to the needs of the situation and proceeded quite logically from one forward step to another.

Different people and different regions react to new ideas differently; regional imbalances in the magnitude of achievement and accomplishments are not rare. To a considerable extent reaction depends on their attitudes, work styles, outlook and receptivity as well as their cultural values including the bare attitude towards life and work itself, in the form of their aspirations for a higher standard of living or the lack thereof. Punjab no doubt had some plus points, including an inherent trait of discipline among its peasantry due to military association etc., but it needs to be remembered that Punjab reached the top of the Green Revolution the hard way with devotion, effort and hard work, supported by the administration and inspired by the genuinely great and progressive nationalist leaders like Partap Singh Kairon. It may also be clarified that this success was not a sudden development—much less a miracle—it was in fact the culmination of a process which had started in 1950 when land was allotted to the refugee farmers of West Punjab who were used to irrigation farming in the canal colonies and then the consolidation work started. Punjab, thus, was able to give a lead to the rest of the country by its superb performance in agricultural production throughout. Some regions followed in its foot-steps and succeeded—like Haryana and (western) UP. Some did not and some others are still lagging behind.

The question naturally arises why and why not? when the ready example is available and expertise can be had for the asking, oral and visual satisfaction can be had at no cost. More of this later.

A caution

Punjab cannot sit on its laurels. It has no doubt exploited all the natural physical resources of land to the maximum extent. Over 94 per cent of the state's geographical area was under cultivation in 1980-81, as compared with the national average of about 42 per cent. There is hardly any scope now for horizontal increase in land resources. Most of the increase in the gross cropped area will have to come from intensive multiple-cropping, a massive land reclamation programme—all coupled with increased productivity per unit area, with economic and efficient use of vital inputs and higher cropping intensity. The imbalance in the cropping pattern is said to have led to reduced availability of proteins and loss of soil fertility with short root crops of rice and wheat. This will have to be rectified by a change over to cultivation of legumes, pulses and oilseeds. Steps will also have to be taken to undo the damage caused to the water table by excessive tubewelling in the state.

NOTES

1. M.S. Randhawa, 'Green Revolution—A case study of Punjab,' Vikas, New Delhi, 1974, p. 31.
2. According to Malcolm Darling in his "Punjab Peasant in Prosperity and Debt", 1947, "these people were the most desirable of the colonists—For industry and thrift the Ludhiana Sikh is hard to beat and the Sikh from Amritsar, though he may be spendthrift and violent, is unsurpassed as a cultivator—In less than a generation, he made the wilderness of Lyallpur blossom like a rose. It is as if the energy of the virgin soil of the 'bar' area has passed into his veins and made him almost a part of the forces of nature which he has conquered."
3. Dr. M.S. Randhawa—"Green Revolution"—*Ibid.*
4. NCAER's Techno-Economic Survey of Punjab, 1959-60, p. ix.
5. NCAER's Techno-Economic Survey of Punjab, 1959-60, p. 5.
6. NCAER Report, *Ibid*, p. 6.
7. These statistics are from NCAER's Report, pp. 11-25.
8. NCAER's Report on Punjab 1962; p. 27.
9. R.N. Chopra, Evolution of Food Policy in India, Macmillan, India, 1981, p. 186.
10. PAU; Dynamics of Punjab Agriculture, 1966, p. 9.
11. Ludhiana PAU—*Ibid.*, p. 28.
12. M S. Randhawa—Chapter "Growth with Stability" in New Horizons, issued by DPR Punjab 1976; pp. 40-41.
13. Venkateswarlu "Dynamics of Green Revolution in India"—*Ibid.*, p. 269.
14. "Our Agricultural future"—Sri Ram Memorial Lecture by Dr M.S. Swaminathan 16 Jan. 1984, Punjab Haryana and Delhi Chamber of Commerce and Industry.

Impact on Haryana

Haryana was created a separate state on 1st Nov. 1966 as a by product of setting up the Punjabi Suba, dividing the post independence Punjab into 3 parts, viz., Punjab, Haryana and hilly districts—the latter merging with Himachal Pradesh. In composite Punjab, its Hindi region always had a grouse about neglect in development matters, no doubt with some justification. As compared with the Punjabi region, it did lag behind in many ways but when seen against many other states in the country and some all India averages, this region was doing fairly well. The grouse was not misplaced, all the same, since the Punjabi region was forgoing ahead much faster.

On separation Punjab and Haryana both progressed economically, especially in the agricultural field in their own ways, starting with their respective base in 1966-67. It is doubtful if Haryana would have developed that fast if it had not emerged into a separate state. Even Punjab would have treated it as a poor relation, as it did before Nov. 1966 to some extent, if not as a "mill-stone round the neck" for its comparative backwardness.

In 1966-67, Haryana had a percapita income of Rs. 589 as compared with all India's Rs. 472. It was a region surplus in food since 1950-51. In 1968-69, with 2.4 per cent of net sown area in the country, it contributed as much as 12 per cent of its market arrivals in wheat. This progress was achieved through intensive cultivation, reflected in a much higher proportion of irrigation and multiple cropping to the net sown area, as compared with the national average, coupled with relatively larger holdings and progressive outlook of the farmers which had initiated the process of mechanisation in agriculture, interalia.

Very soon Haryana became one of the few states which were well exposed to the impact of the Green Revolution. The farmer community was quite receptive to modern techniques of cultivation and in a position to make the necessary effort for achieving higher output levels. Whether in irrigation, use of hyv seeds, fertilisers,

pesticides, electrification (it was the first state in the country to electrify all its villages) and transport, viz., in the entire gamut of agricultural production and productivity, Haryana presents an example of quite a progressive state, ever trying to improve and catch up with the best in the country, that is, Punjab. A 'go-getter' in outlook and competitive in approach, Haryana has made remarkable progress in the last 15 years. Not an easy thing to do this and we will have to analyse how all this happened.

Haryana as part of Composite Punjab

Haryana state with 7 districts and a population of more than 7.6 million (1961) at birth has two physical divisions—the plains and the Aravalli range. The plains cover the entire state except south of Mohinder Garh and s.w. part of Gurgaon districts. On the basis of aridity, the plains can further be subdivided into eastern and western plains. The western plain, covering Hissar and Mohinder Garh districts, has a higher degree of aridity, bounded by the Aravallis on its eastern side. It has been a thirsty land clothed by steppe vegetation with sand dunes of various shapes and sizes. Eastern plain starts from west of River Yamuna upto 50 centimeter rainfall line, flat with an elevation of 200-230 metres above sea level, with fertile, light and loamy soil. No rivers pass through the state. The Ghaggar in the northern extreme is nonperennial. The Jamuna presents as the eastern boundary with U.P. The rainfall varies from 25 centimeter in Hissar district to 110 centimeter in the eastern Ambala district, increasing from S.W. to N.E. The climate is semi arid and hot in the south-west and gangetic type in the rest of the State.

In 1951-61 the population had increased at the rate of 34 per cent—as compared with All India increase of 22 per cent. Rural population was 83 per cent of the total. Number of villages was 6670 in 1961. The working population of the state was slightly lower as a proportion of the state population viz., only 38 per cent compared with all India's 42 per cent—mainly because of a lower participation of women in economic activities viz., 21 per cent, against all India's 28 per cent. (Punjab has only 5 per cent participation). Total population of Haryana had increased to 12.9 m. by 1985.

In composite Punjab Haryana was comparatively behind Punjab region in economic prosperity on many counts though it was much better developed than many other states. For example, in 1961-62, percapita income in Haryana was Rs. 339/- as compared with Punjab region's Rs. 467/- and Rs. 334/- of all India. In 1965-66, percapita income became Rs. 469/- compared with all India's Rs. 430/- at current prices. In 1966-67, it became Rs. 589/- in Haryana compared with all India's Rs. 482/-. This shows that Haryana region was developing all right in the last five years of its connection with the composite Punjab.

Haryana Development Committee Report 1966

The Haryana region, also called Hindi region of the post 1947 composite Punjab, always had a grouse that in the matter of development its interests were not

properly looked after by the state government and preference was always given and shown to the problems of the Punjab region. The state government appointed a Haryana Development Committee on 20 March 1965, chaired by late Pt. Shri Ram Sharma and consisting of some vocal MPs' and MLAs' of the region, besides the concerned senior officers. The Committee was to study the socio-economic conditions of the region to locate its economic deficiencies and "perspective potentialities" and recommend measures for its accelerated and integrated growth etc. The Committee gave its report in January 1966, making a fair and constructive study of the problems of the region concerning agricultural production, animal husbandry and dairy development, irrigation and drainage problem, industries and communications etc. We are concerned here only with agricultural development and irrigation.

Haryana region was comparatively backward in irrigation, electrification and literacy. In the matter of food crops, though its area was more, production and productivity were less than that of the Punjab region because its crops were low yielding—major portion of the area being under coarse grains. Productivity in non-Haryana region was 154 per cent of Haryana region; the latter was at a considerable disadvantage if the differential in relative prices of grains was also taken into account. The fact that area under cash crops was also less than that in the Punjab region further reduced the income for agricultural worker or per unit of cultivation in Haryana region. In double-cropping and intensity of cultivation Haryana was already a shade better, though. And so on.

No two regions in a state can be developed equally nor are they equally endowed in natural resources. In any case the point had been made by the Committee that Haryana did need more attention of the authorities in the matter of development. The Committee made some very useful and constructive recommendations. Extraordinarily, the Committee commented on the speed of implementation of new projects and suggested weightage of 50 per cent to Haryana region in the matter of district and regional schemes and location of some important state-wide projects in the region itself. It suggested the appointment of an effective team of officers, to watch and ensure the proper implementation of developmental programmes in Haryana. Not only the development of this region should be made the special charge of one Cabinet rank minister, there should be a Board with non-officials to make suggestions and monitor implementation. For coordinating the development work it recommended the appointment of a senior officer as had been done in the case of the Punjab Hilly areas since 1961.

These were important administrative measures suggested in time.

The economic planners of Haryana state also had always been keen to emphasise the economic backwardness of Haryana. This was primarily intended to draw attention to the allegation that in composite Punjab the interests of Haryana were neglected and in result the region lagged behind the Punjab region in many respects. The Fourth Five Year Plan of the State (1969-74) states the position in the following words :—

"Although natural hurdles stood in the way of achievement of a high growth

rate in the Haryana region, there are indications which pinpoint the neglect which Haryana suffered in the programmes of development."

"Haryana is backward as compared with other states and the country as a whole. The level of urbanisation in this state is 17.2 as compared with 28.2 per cent in Maharashtra, 26.7 per cent in Tamil Nadu, 25.6 per cent in Gujarat—and 17.7 per cent in India. The per cent of workers engaged in agriculture and allied sectors is 71.1 in Haryana, 38.3 in Kerala, 53.8 in West-Bengal, 60.5 in TN and 69.5 in India.

"Besides educational and industrial backwardness Haryana has special problems relating to drinking water-supply, flood control and drought affected areas—while there is an acute scarcity of irrigation and drinking water in the state, there are areas which are subject to recurrent floods, involving considerable damage to crops and other property. This is the picture of Haryana which emerges after a decade and half of development. Even though Haryana was primarily an agricultural region, the level achieved in the development of this field was not marked. The net irrigated area 12.25 lakh hectares and its per cent to the net sown area was only 36.6. The fertiliser consumption per acre was only 7.5 kg. The intensity of irrigation ranged from 50 to 60 per cent. The power consumption per acre was 52.9 units. These indicators depict clearly the comparative imbalance in the development of Haryana at the end of the Third Plan".

The planners also complained of neglect by the Centre because Central investment in the region in the preceding 18 years had amounted to only Rs. 8.5 crores—out of a total Rs. 2,119 crores invested by the Centre in various states in the country. They pointed out the comparative backwardness of the region in the sphere of small scale industries as well vis a vis Punjab.¹

Here it will be noticed that the Haryana State government not only dealt with its comparative backwardness vis a vis Punjab but also pointedly brought out where it stood within the country as a whole.

Pre 1965-66 position

Between 1950-51 and 1964-65, foodgrains production in the state (Haryana region then) had increased from 12.5 lakh tonnes to 27 lakh tonnes—an increase of 118 per cent. Increases registered in the production of oil seeds, cotton and sugarcane were 127 per cent, 120 per cent and 268 per cent in the same period—mainly due to increase in irrigation facilities. Other highlights of agriculture in Haryana before it acquired statehood (figures² relating to 1964-65) were :

- (i) agriculture was contributing 16 per cent to the state output, as compared with all India's 39 per cent, with the same percentage of work force.
- (ii) it had more area under the plough for cultivation and higher land productivity than all India's ;

- (iii) net sown area per cultivator was 1.90 ha in Haryana as compared with 1.31 ha all India's ;
- (iv) land productivity, judged as gross value of output per ha of net sown area in the same year was Rs. 842 in Haryana as compared with all India's Rs. 763.
- (v) double cropped area in Haryana was 31.2 per cent of net sown area in 1964-65, compared with all India's 11.5 per cent—mainly due to good irrigation net work ;
- (vi) net area irrigated in Haryana that year was 35 per cent of net sown area, compared with all India's 19.1 per cent ;
- (vii) agricultural development in Irrigated areas of Haryana was comparable to the best elsewhere in the country—with all signs of prosperity in extensive use of fertilisers, tractors, pumpsets and pesticides. In contrast, in its unirrigated tracts—which still formed bulk of the cultivated area—the cropping pattern was dominated by low-value crops where per acre yields were low. With the latter taken into account, the productivity averages got reduced to all-India averages in money terms ;
- (viii) at this time in Haryana, wheat and rice covered only 20 per cent of the cropped area (compared with All India 31 per cent). Though these grains fetched better price per-hectare, gram covered 29 per cent of the area, fetching the lowest price, thus depressing the average productivity of the state ;
- (ix) irrigation not being adequate, 31 per cent of wheat and 28 per cent of rice were cultivated in unirrigated areas. Hyv wheat was sown in only irrigated areas ; in the rest, only local improved varieties were used, yielding much less per hectare ;
- (x) in 1964-65 per hectare yield of wheat in Haryana was 1275 kg, of gram 731 kg, barley 1122 kg, rice 1138 kg Fall more than the all India levels.

In overall terms, with 1.7 per cent of country's population Haryana was producing 3.1 per cent of country's foodgrains, cotton 5.3 per cent, oil seeds 1 per cent of country's foodgrains, cotton 5.3 per cent, oil seeds 1 per cent, sugarcane 0.6 per cent. Though the state was overall surplus in foodgrains, in wheat it was deficit till 1966-67, depending on imports from Punjab. Taking percapita daily consumption of 15 ounce cereals and 3 ounce pulses and making allowance for 12½ per cent for seed, feed and wastages, the State was surplus in cereals to the extent of 1 lakh tonnes in 1964-65, and in pulses by 7,68,000 tonnes viz. 23 per cent of output in cereals and 77 per cent in pulses were surplus. And no wonder that the state was able to make still more remarkable progress after attaining statehood.

In the Techno-Economic Survey Report (1970) of Haryana, made by the NCAER, it was mentioned that this state had a much bigger scope for agricultural development than many other states since it was fairly developed in irrigation ; its farmers were proficient in irrigated cultivation ; they were aware of the utility of fertilisers, pesticides and other modern methods like the use of hvv seeds etc. Cultivation could be further extended in fallow and wastelands upto about 3 lakh hectares

of land. Though the major source of irrigation in Haryana would continue to be the canals, the need for supplementing it with tubewells and masonry-wells was stressed. For drylands the sinking of tubewells was necessary, in any case. Two important programmes were suggested in this connection. One was the use of groundwater where available, even to conserve the surface water for use in dry areas but for this it would be necessary to have detailed investigations carried out, including exploratory borings in areas where tubewells were not then available and where the potential of groundwater and its suitability for irrigation could be determined by drilling. Second suggestion was that the programme of rural electrification should be coordinated with the tubewell sinking programme.

Further suggestions related to all year round cropping in irrigated areas, through a system of crop rotation for which the IARI and the Punjab Agricultural University (PAU) had evolved suitable varieties of short duration crops already in use by some progressive farmers. It was estimated that multiple cropping covering only 31 per cent of the net sown area in the state, could be increased to 46 per cent in the Fourth Plan. Shift could be in favour of high value crops like rice, wheat, oil seeds and hybrid bajra etc; a suitable combination of crops and rotation could be evolved to improve incomes, taking into account the soil, irrigation and climatic conditions and so on.

Steps taken by the new state

Haryana thus came to be constituted as a separate state when it was fairly advanced in agricultural production and had adopted some improved methods of cultivation. In spite of this, the agricultural economy of Haryana was still at a subsistence level. The problems were lack of adequate irrigation support, traditional farming practices, nonavailability of power, fertilisers, seed and pesticides etc. "A great deal of extension was still to be done to introduce the farmer to the new agricultural practices embodying new farming techniques, adjustment to the rainfall pattern, increased but selective use of chemical fertilisers, successful adoption of hyv, enlightened water management practices, effective use of insecticides and pesticides as also a greater degree of mechanisation. The task was a difficult and complex one. Lack of an engineering base exclusively supporting agriculture had been another stumbling block. Though considerable awakening had resulted from the all time records of food production during 1967-68, the real agricultural breakthrough based on a completely scientific oriented agricultural strategy was still to be achieved".³ Even though in the matter of consolidation of holdings the state was advantageously placed, having covered 95 per cent of the area already, the state was conscious of the inadequacy of institutional arrangements for agricultural credit, unsatisfactory marketing arrangements and inadequate storage facilities as well. It was obvious that concerted efforts would be necessary to remove the various bottlenecks impeding implementation of agricultural programmes.

It was in this sort of a background that a new vigorous chief minister Bansi Lal came into position (1968); he was a leader of men who would collect all the good ideas to carry the new state further forward as quick as possible, to the

Punjab level if not beyond, and he did not suffer from any mental dichotomy or confusion of ends and means. A 'go-getter' in every sense of the word, he chose his means and he chose his men to do the job; the Haryana farmer was already wide awake, keen and enlightened enough to give full cooperation in marching ahead. The NCAER had broadly shown the way (1969-70) in its Report; the Green Revolution ideas had already taken root in the Haryana soil. For the rest, the Chief minister made sure that the administration played its part well. The Revolution was allowed to blossom forth in full swing. The Punjab pattern was there to egg everybody on in the forward direction.

Even in 1973-74 the observers were saying that the change over the fields of Haryana was to be seen to be believed. There was not a patch of land not under cultivation. "The farmers had won the first round of the Green Revolution, the wheels of which had turned faster ever since Bansi Lal came on the scene. Not even the vagaries of nature and the selfishness of man could slow down the speed of their onward thrust."⁴

Since 84 per cent of the total area of the state was already under cultivation, there was little scope for its expansion laterally. The authorities, therefore, concentrated on increasing the yield through more irrigation facilities, double cropping and application of approved technology. It was possible to introduce intensive cultivation on a big scale because of the hyv seeds of cereal crops; the state had launched on a massive seed production programme as well, for its farmers.

The Government of Haryana took over the responsibility of prospecting for groundwater. Boring tests were carried out and modern blasting techniques used in Gurgaon and Mohinder Garh districts to unearth subsoil water. Agencies like the ARC (Agricultural Refinance Corporation, now called NABARD), Land Mortgage Banks and Central Cooperative Banks were to advance loans on easy terms for the sinking of tubewells and construction of minor irrigation channels.

Apart from the supply of fertilisers and pesticides arrangements were made by the Government for mobile vans for rural areas to advise farmers of their use. Centres for the sale of pesticides were opened; storage facilities were provided. Besides, the state government set up 5 schools for farmers to learn new scientific technology of farming. Pilot projects and package programmes were introduced for the spread of multiple cropping. Agencies were started for the education of small and marginal farmers in modern methods of cultivation—all against a fixed target of 10 per cent increase in foodgrains production annually. It was a very bold objective; it was a battle royal against nature and traditional modes of cultivation.

But the "piece de resistance" of the Bansilal regime was the lift irrigation schemes—half a dozen in number, bold in concept and quick⁵ in implementation. They say a U.S. trained engineer—one Krishan Swaroop Pathak—had convinced the Chief Minister of the benefits of such lift irrigation schemes for dry areas of Haryana, to make use of the flood waters of the river Yamuna, lift them up against the lie of the land by electricity and then convey them down in lined canals and channels to the parched areas of the state. It appeared to be an impossible task, both physically and financially, yet it was performed boldly and with confidence. In half a dozen years, as many lift irrigation schemes seemed to change the face of Haryana—an

unbeaten feat which only an imaginative Bansilal could perform. When the present writer as Advisor to the Haryana Governor had a look at some of these projects, during an afternoon drive between Ambala and Rewari in the summer of 1977, he could not help saying that no chief engineer irrigation would have sponsored them—much less carried them through. Only an exceptionally calibre and politically strong chief minister could perform the miracle. The entire project made political and financial sense also when explained properly.

Broadly, the components of Haryana irrigation plan were :

- (i) irrigation systems for the chronically drought-affected areas through lift irrigation schemes;
- (ii) increasing the irrigation intensity of existing canals;
- (iii) exploitation of groundwater reservoir by installation of tubewells;
- (iv) conjunctive use of ground and surface water;
- (v) conservation of flood waters;
- (vi) internal land drainage and river protection.

Extensive exploration for groundwater established that 1,60,000 sq. kms area had sweet water aquifers. Detailed drilling was to indicate the precise areas where tubewells-deep and others—could be sunk. Between 1968-69 and 1972-73 the number of tubewells and pumping sets in the state had more than doubled, reaching a figure of 1,38,000 in the latter year.

The state government attached equal importance to power generation and distribution, including rural electrification. Minor irrigation schemes could not prosper without the latter facility. The Chief Minister had told his officers in May 1968 to go all out to electrify all Haryana villages, about 7,000 in number. In less than four years wires, transformers, lines and cables had reached all the villages.

Units generated increased from 60-65 crores in 1967-68 to 163.37 crores in 1972-73. The daily demand in 1972-73 was for 6.5 million units but the supply was only 4.1 million units. Per capita consumption had risen from 57 units in 1968-69 to 118 units in 1972-73, tubewell connections had increased from 27,589 in 1968-69 to 1,16,882 in 1972-73, and the total number of consumers from 34,053 to 5,29,453 respectively.

Progress upto 1978-79

During the first twelve years of its existence, the state income had registered 6.9 per cent average annual growth rate as against 4.4 per cent in the national income. The increase in population was only 2.7 per cent per annum. Net state domestic product, which in 1960-61 was Rs. 245 crores (including Rs. 153.7 crores from agriculture and allied sectors), and only Rs. 301.4 crores in 1966-67 including Rs. 171.7 crores in agriculture sector, had increased to Rs 655.2 crores in 1978-79 at 1960-61 prices, including Rs. 345.1 crores from agriculture and allied sectors.⁶ This was a good going-total 170 per cent growth in 18 years.

Agricultural sector had played a pivotal role in the state. Agricultural production had increased because of a considerable build up of infrastructure in the sector during the period 1966-67 to 1979-80. In the same period, the net sown area had increased from 34.23 lakh ha to 36.60 lakh ha, and double cropped area from 11.76 lakh ha to 18.90 lakh ha.

Agricultural production rose progressively. Index number of production increased from 71.15 in 1966-67 to 160.10 in 1978-79 (taking triennium ending 1969-70 as the base year=100). The foodgrains production went up from 25.92 lakh T. in 1966-67 to 63.34 lakh T. in 1978-79 (144.3 per cent increase), the index rising from 67 in 1966-67 to 171.75 in 1978-79, with the base as indicated. The index number of agricultural production had risen at an average rate of 8 per cent per annum.

A major portion of increase in the output of foodgrains during 1978-79 was possible because of increase in productivity per unit of area, resulting from increase in irrigation, introduction of hyv seeds and increase in the use of fertilisers and so on. Irrigated area increased from 12.93 lakh ha in 1966-67 to 19.17 lakh ha in 1978-79. Similarly area under hyv seeds of wheat, bajra, rice and maize increased from 16,000 ha in 1966-67 to 1,99,000 ha in 1978.79. Consumption of fertilisers (nutrient) input similarly increased from 3.6 kg per ha in 1966-67 to 57.2 kg/ha in 1979-80—total consumption having reached 2.15 lakh tonnes in that year. Number of tractors had risen from 4,803 to 36,833 in this period. It be noted that all these “inputs” had gone into an already “consolidated” land.

The average yield per ha during 1966-67 and 1978-79 may be seen in the chart below :—

Crop	Average yield in kg/ha				
	1966-67	1978-79	1980-81	1981-82	cf : Punjab 1982-83
Rice	1161	2680	2602	2470	3040
Wheat	1425	2293	2359	2357	2900
Bajra	418	440	NA	NA	1200
Maize	988	784	NA	NA	1935
Barley	1313	1573	NA	NA	1400
Gram	500	980	629	NA	825

Source : Haryana, Sixth Five Year Plan 1980-85, P. 3 and *Indian Agriculture in Brief*, 1982.

Irrigation

At the end of the Third Five Year Plan (1965-66) the irrigation potential, and its utilisation through various canal systems, was 11.92 lakh ha and 11.53 lakh ha respectively. By end 1978-79, the potential had increased to 17.69 lakh ha and utilisation to 16.30 lakh ha. The net area irrigated rose from 12.95 lakh ha 1966-67 to 19.17 lakh ha in 1978.79. Despite an increase of 6.2 lakh ha net irrigated area

in this period, including that covered by the tubewells/pumping sets having increased from 1,68,659 ha in 1973-74 to 2,58,689 ha in 1978-79, 47.5 per cent of the total area sown was still dependent on the rain. Infact, the state still faced the twin problems of drought and floods.

Power

Power consumption in the agricultural sector also had a big spurt between 1966-67 to 1979-80 when the number of connections increased from 20,190 (6 per cent of total in the state) to 2,04,340 (20 per cent of the total) and power consumed went up from 985 lakh units (22 per cent of total available) to 9,463 lakh units (10 per cent of total then available). The number of tubewells energised increased from 20,190 to 2,04,340 in the same period.

Roads

If the production of foodgrains etc. is there, there must be roads between villages and market towns for sale. Infact, in a way better communications are an essential input (infrastructural) in agricultural production. The length of metalled PWD roads in Haryana increased from 5,694 Km in 1966-67 to 16,705 Kms in 1979-80—an increase of 193 per cent. The number of villages connected with pucca roads increased from 1,386 to 6,110 in the same period—an increase of 341 per cent. Total number of villages in the state is only 6731. In this period, fleet strength of Haryana roadways buses increased from 496 to 2300—a 364 per cent increase.

Position in 1984-85

The level of foodgrains production was to touch 75 lakh tonnes in 1981-85. Achievement in 1982-83 was 66.6 lakh T. and 69.24 lakh T. anticipated in 1983-84. The increased targets were achieved mainly through increase in productivity per unit area by strengthening of various supportive programmes like availability of hyv seeds, emphasising balanced use of fertilisers, plant protection measures and extension programmes.

Total fertiliser consumption achieved during 1980-81 to 1982-83 was 2.33, 2.54 and 2.72 lakh T respectively. 1983-84 was likely to consume 3.31 lakh T and the target for 1984-85 was 3.49 lakh T. To step up extension services, including the taking of modern agricultural practices to the farmer's door steps, an agricultural "Extension Project based on T & V system" was being implemented with World Bank assistance. A Crop Insurance Scheme had also been introduced in the state. Special programmes for rural development were being carried out including IRDP, NREP, DPAP and Desert Development Programme as well as programmes of assistance to small and marginal farmers for increasing agricultural production.

Under major and medium irrigation, the major thrust of the programme was on consolidation of the facilities already created, modernisation of existing canal system for improved efficiency, expeditious completion of schemes in drought

prone areas and expansion of irrigated agriculture. An additional potential of 36,000 ha would be created during 1984-85.

Under minor irrigation, 15,000 additional tubewells were to be installed during 1984-85, raising the total number of tubewells/pumpsets to 3,85,467 by end of the year. The gross area irrigated by minor irrigation units was to increase to 13.125 lakh ha by end of 1983-84 and 13.125 lakh ha by end 1984-85. The state groundwater organisation would carry out hydrological and geophysical surveys, undertake studies on utilisation of ground water development and monitoring in the state.

Command area development programme was being implemented in 24 blocks in the state—including soil survey, land levelling, construction and lining of field channels, warabandi and chakbandi.

Flood control measures and power augmentation programmes also were in hand.

Some other main points relating to this remarkable 'growth' in foodgrains production in Haryana in the 14 years of its existence may be summed up as under :—

- (i) Out of a cultivable area of 38.8 lakh ha in 1978-79, 19.17 lakh ha was irrigated and 48.76 lakh ha gross area was being cropped under major foodgrains, oilseeds, sugarcane and cotton. This quite high (from Indian standards) cropping intensity implies that future increase in production would be obtained conjointly with the adoption of improved agricultural practices in the new irrigated areas.
- (ii) Data reveals that during 1974-77 area under hyv seeds increased by 37.7 per cent and in the Sixth Plan it would go up still further.
- (iii) Consumption of nutrients increased by 170.4 per cent during the Fifth Plan and by 50 per cent during the Sixth Plan.
- (iv) With a view to ensuring inputs and expert advice essential for maximising production, a variety of schemes connected with activities such as soil testing, distribution and production of improved seeds and crop protection, chemicals etc, were taken up and special agencies established for command area development, drought prone area development, special support of small and marginal farmers, land reclamation and for education and research in agriculture and so on.
- (v) The state had achieved a level of 64 lakh tonne of annual foodgrains production by 1978-79 and 75 lakh T. in the subsequent years. In its wake followed various marketing and storage measures; new markets were opened; a rural road construction programme was adopted side by side; a big storage construction programme was taken in hand.
- (vi) In addition to rural credit, the cooperatives covered other areas of activity also such as distribution of fertilisers, processing and marketing of agricultural produce, dairy farming consumers cooperatives, cottage and small scale industries, sugar and spinning mills etc.
- (vii) Enough has been said already about the wisdom of putting up lift irrigation schemes to serve the arid areas of south west where water could

not reach by mere gravity flow, to use surplus flood water, to begin with and then to use the same channels for perennial use on the availability of the share of Ravi Beas waters, when the Sutlej Yamuna link portion passing through Punjab was completed. With the construction of these schemes, the irrigation potential had increased considerably, from 15,29,000 ha by the end of 1973-74 to 17,50,000 ha in 1978-79 and to 17,69,000 ha in 1979-80—with more to follow.

- (viii) Consolidation operations being an integral part of the Command Area Development Schemes, these operations in the newly commanded areas in Bhiwani District (Jui and Loharu Canals) had to be completed, involving a total area of 2.20 lakh acres—41,436 acres done by 1978-79 and balance in the Sixth Plan.
- (ix) The groundwater potential of the state was assessed on the basis of available factors of recharge and draft data. The total recharge in the state was 8,87,246 ham. Against this availability, the total effective draft on 1.4.79 was 6,63,893 ham, leaving a balance of 2,23,354 ham for further development. On 1.4.79, the number of minor irrigation units was 18,069 dugwells, 34,841 pumpsets, 203,748 shallow tubewells, 1561 deep tubewells for direct irrigation and 1589 state tubewells for augmentation of canal water. (See also Table 13 in Chapter 4 (iv) on Irrigation).

Some comparative Statistics of Haryana State are given in Table 21 following.

NOTES

1. Haryana—Fourth Five Year Plan (1969-74) Document PP. 7-9.
2. NCAER : Techno Economic Survey Report on Haryana, 1970.
3. Haryana Fourth Five Year Plan 1969-74, PP. 12-13.
4. Muni Lal—'Haryana', Vikas (1974), P. 45.
5. These lift irrigation schemes were executed at a speed which attracted the notice of the Irrigation Commission in 1972. It said :
 "One important aspect which struck the Commission most was the tremendous speed with which the lift Irrigation schemes have been implemented in this part of the country. By any standards this is an engineering feat of which any country should be proud. Haryana evidently has the capacity to organise and push through the schemes. Considering that many of our large irrigation projects and particularly the canal systems have been held up in many parts of the country by incomplete works and land acquisition disputes, it was most encouraging to see a large lined canal with several pumping stations completed well in time. The time itself was set for a furious pace."
 Source : Munilal "Haryana", Vikas 1974 P. 70.
6. Haryana—Draft Sixth Five Year Plan, 1980-85, P. 2.

TABLE 21
Progressive Statistics of Haryana

Item	Unit	1968-69	1969-70	1970-71	1971-72	1972-73	1978-79	1980-81	1981-82
Total area	'000 ha	4399	4402	4402	4402	4402			
Total cultivable area	"	3703	3709	3709	3726	3726			
% of cultivable area to total	%	84.2	84.3	84.3	84.6	84.6			
Net sown area	'000 ha	3273	3548	3550	3567	3567	3660		
Total cropped area	"	4053	4941	4950	5048	5048	5550		
Intensity of cropping	%	109.5	133.2	133.2	135.5	135.5			
Net irrigation area (canals)	'000 ha	907	950	952	965	1168	1194	1222	1243
M.I.	"	405	458	580	600	640	1257	1292	1333
Total	"	1302	1408	1532	1565	1808	2451	2514	2576
% of net sown area	%	40.1	39.7	43.0	43.9	56.6			
Total gross irrigated area	'000 ha	1864	2158	2230	2325	NA	2979		
% of total cropped area	%	46.0	43.7	45.0	46.1	"	53.9		
Foodgrains Production	'000 Tons.	2764	4626	4771	4546	3943	6334	6045	6050
Yield	Kg/ha	737	1197	—	—	—	1488	1519	1391
Bajra	Acres	127,000	326,000	600,000	535,000	1,240,000			
Maize	"	19760	28810	35000	35000	25000			
Paddy	"	25790	49000	75000	175000	225000			
Wheat	"	640180	1100000	1500000	2000000	2,000000			
Total foodgrains	'000 ha	3520	3867			3605		3482	4342

Fertiliser

Total consumption	Tonnes		in kg per ha/			
"						
Tubewells and pump sets	Nos.					
Tractors	Nos.					
Taccavi	'000 Rs.					
Crop Loans	"					

2,30,820 2,51,598
42.5

39.6

82,130 96,920

104,358 119,529

12,312 15,618

58,047 84,199

9403 10,563

24,668 29,818

121,842 150,097

156,748 192,486

224,946

258689 36833

Power

Units generated	per annum	60.65	91.89	107.30	123.84	149.14	163.37	(1967-68 onward)
	in crores							
Per capita for daily consumption	in units	57	—	—	—	118		
Number of consumers	all categories	349,575	405,930	470,010	543,695	616,249/668449		at end of year
Number of agri connection		20,190				204,340		
Total power consumed in agri	units in crores	9.85				94.63		

Source : Compiled by author

Impact on U.P.

Introductory

This most populous state of the Indian Union has all along had a most pronounced impact on the affairs of the country which is due to its size, strategic position and the fact that it has given her four Prime Ministers out of five who have ruled India for 35 years out of 38. And yet it is one of the poorest states in the country, reflecting all the problems of underdevelopment in an acute form. By nature being of the richest Gangetic plain, with perennial rivers running through it and leaving behind the most fertile soil, it supports a concentrated population, now over 12 crores, but it just supports it, inspite of possessing the oldest irrigation system in the country and yielding so little per acre, thus reducing the economy to a bare subsistence level. What is really disappointing is the fact that inspite of all these years of planning since 1951, the state has not *much* improved its economy, neither in percapita terms nor in its relative position among other states of the Union. Ostensibly the blame is put on the smaller outlays by the state planners but experience in India and elsewhere shows that, apart from financial investment generating growth in the economy, there are many non-economic factors which are equally, even more, important for that growth. Political will and determination, administrative efficiency, institutional arrangements, coordinated approach in planning and implementation, social outlook of the people towards work itself and, last but not least, the more wieldy and manageable size of the state to work on, in a federal set up—these are a few such factors. UP will have to attend to all these and streamline its administration in many normal, even unconventional ways, with a view to developing its economy and finances in a manner conducive to purposeful utilisation of resources which will raise its people far above their present poor standards.

TABLE 22

Some Comparative Economic Indicators (Four States Compared with All India)

Item	Unit	UP	Bihar	Punjab	Haryana	All India
1	2	3	4	5	6	7
	1981					
1 Population	'000 person	1,10,858	69,823	16,670	12,851	6,83,810
2 Geographical Area	sq km	2,94,413	1,73,876	50,362	44,222	32,87,782
3 Density of Population	per sq km	377	402	331	291	221
4 % of urban population	to total	18.01	12.46	22.72	21.96	23.73
5 Decennial growth rate of population 1971-81		25.52	23.90	23.01	28.04	24.43
6 Literacy rate	as % to total	27.40	26.01	40.72	35.84	36.12
7 Average size of agri holdings	in ha	1.05	1.11	2.74	3.58	2.0
8 Number of agri-cultural workers	in '000 S	24,013	16,406	2,863	2,202	1,40,766
9 Per capita Income at current prices	1971-72 1981-82	497 1313	415 995	1121 3122	960 2581	
10 Per capita Income	in Rs. at 1970-71 prices	509				712

1	2	3	4	5	6	7	
11	Fertiliser consumption per ha	1980-81 kg/ha	49.3	17.7	117.9	42.5	32.0
12	Ditto "	1981-82 "	60.5	—	127.8	—	36.6
13	Ditto—Total 1981-82	'000 Tonnes	1269.60	205.23	820.48	251.58	6,064
14	Number of villages electrified	on 31-3-82	47525/11256	23108/67566	12126/12188	6731/6731	2,94,487/5,76,126
		nos & %	42.2	34.2	100.0	100.0	51.1
15	Consumption of power in agri Sector	1979-80 % of total	33.5	6.8	38.7	39.4	16.9
16	Ditto power used compared with total GWH	1979-80	Agri 2518	270 Agri	1898 Agri	2348 T	13189
			Total 7610	3941 T	4908 T	926 Agri	78226

Source :— Indian Agriculture in Brief, 1982.

Statistical Outline of India, 1984, TATA Services Ltd.

Let us see some comparative statistics to serve as broad basic indicators of the present state of the economy of UP, in Table 22 preceding.

UP's economy is mainly agrarian; with a weak industrial base. 51.5 per cent of the state's domestic product originates from agriculture and allied sectors and 78 per cent of the population is dependent on it for work. The size of holdings in the state shows a close relationship to the pressure of population. Agriculture being the mainstay of the people, the higher their density in a district, the greater is the percentage of below-margin holdings in that district. Of the 15.16 million total holdings, 10.10 m. or 66.6 per cent are less than 1 ha in size categorised as below marginal; 4.51 m. holdings or 29.71 per cent are marginal i.e. between 1-5 ha and 2.83 per cent or .43 million are medium sized between 5 and 10 ha. Large ones over 10 ha are only .73 per cent or .11 million in number.¹

The largest concentration of below-marginal holdings lies in the eastern and north eastern parts of the state—more than 80 per cent in districts like Varanasi, Jaunpur and Azamgar; districts with least per cent of such holdings (only 30-40 per cent) are Rampur, Moradabad, Shahjehanpur, Pilibhit, Bareilly, Bijnor in the western region and Badaun in Bundelkhand region. This concentration of small holdings is pronounced in districts where land-man ratio is acute. Obviously, therefore, the pressure of population on land would need reduction by creation of non-agricultural employment and other means.

Average size of holdings in UP is 1.05 ha, compared with average 2 ha in India as a whole, 2.71 ha in Punjab, 3.58 ha in Haryana, 1.11 ha in Bihar.²

Out of the total cropping area of over 29.8 mha, the net sown area in 1978-79 was 17.5 mha, viz. 58.7 per cent. 51 per cent of the net sown area was irrigated. Agricultural (foodgrains) production was low—with 231 lakh T. in 1978-79, 212 lakh T. in 1977-78 and 242.20 lakh T. in 1981-82. See some comparative figures below for the two years 1981-82 and 1980-81 in respect of per ha yields of wheat and rice in respect of four states under study :

TABLE 23
Yields of Wheat and Rice (in kgs/ha)

States	1980-81		1981-82	
	Rice	Wheat	Rice	Wheat
Punjab	2736	2730	2957	2932
Haryana	2602	2359	2470	2357
UP	1053	1650	1078	1641
Bihar	1015	1314	781	1473
All India	1336	1630	1317	1698

Source :— Indian Agriculture in Brief 19th Edition, 1982

It is strange that with 51 per cent of the net sown area irrigated, the productivity of these two vital cereals in UP should be below even the all India averages. UP can feel superior only to Bihar in this respect. Productivity being low, the value of output of foodgrains and main commercial crops in 1977-78 (at 1976-77 prices) was Rs. 573 per ha in UP against Rs. 1779 in Punjab, Rs. 1172 in Haryana and Rs. 630/- in Maharashtra.

Total income and Per capita income

Before coming to the income of UP let it be stated that in 1973-74 UP had 15.3 per cent of land and produced 15.2 per cent of India's food. In 1980-81 UP had 16.2 per cent of land producing 19.2 per cent of India's food (225 kg per capita); In 1981-82 UP had 15.8 per cent of land and produced 18.2 per cent of India's food (218 kg per capita). On the other hand, in the years 1980-81 and 1981-82 Punjab had produced 9.2 per cent of India's food with 3.6 per cent of land and 10 per cent of India's food with only 3.9 per cent of land, respectively. For the same two years Bihar produced 7.6 per cent of India's food with 7.9 per cent of land and 6.5 per cent of food with 7.6 per cent of land respectively. UP was slightly better placed than Bihar in these respects.

TABLE 24
Total Income and Per capita Income at Constant (1970-71) Prices

Year	UP Per capita income Rs.	India's Per capita income Rs.	UP as % of India	UP's Total income (crores) Rs.	India's Total income (crores) Rs.	Punjab's Per capita Income Rs.	5 as % of 6
1	2	3	4	5	6	7	8
1960-61	453	559	81.0	4434	—	—	—
1970-71	486	635	76.5	4,256	34,368	1121	12.4
1971-72	497	NA	NA	—	—	—	—
1975-76	781	660	72.9	4,611	39,849	—	11.6
1978-79	509	712	71.5	5,159	45,637	—	11.3
1981-82*	1313	1758	—	14,755	1,21,996	3122	—
				at current prices.			

Source :— (i) UP. Draft Sixth Plan p. 4.
(ii) Tatas' Statistical Outline of India 1984.

It will be seen that there is a clear decline in the period 1970 to 1979. The gap between the UP's percapita income vis a vis all India's has widened. Actually during 1948-49 to 1960-61, UP's percapita income grew at a very much slower rate than all India's. Between 1960-61 to 1969-70 and between 1970-71 to 1978-79 also UP did not catch up with the all India figures though the gap narrowed some what.

47.85 per cent of rural population and 43.50 per cent of the urban lived below the poverty line in 1979-80 as per Planning Commission definition. In 1973-74 these percentages were 63.19 and 49.52 respectively. The improvement is stated to be due to higher growth rate since 1973-74. This is not borne out by the changes in percapita incomes but may be due to increase in per acre yields.

There is a redeeming feature in UP's agriculture, namely in the use of *fertilisers*. There was a quantum jump in the use of fertilisers in the state during 1976-80, highest in India except Punjab and Tamil Nadu. See Table below. Statistics show that agricultural productivity in UP is on the increase from around 650 kg to 1160 kg/Ha. Fertiliser consumption having crossed the limit of 50 kg/Ha by 1981, UP is said to be now set for a take-off in food grains production.

TABLE 25
Fertiliser Consumption—Four States Compared with All India Average
1980-81 to 1982-83

(In '000 Tonnes)

State	Kharif	Rabi	Total	Consumption in grass cropped area (kg/ha)	
				1977-78	1982-83
Bihar	46.5	160.4	206.9	15.4	18.5
Haryana	73.1	171.7	244.8	34.7	47.4
Punjab	239.9	567.2	807.1	72.4	127.8
TN	181.9	303.4	484.7	59.0	58.6
UP	345.0	953.2	1298.2	36.9	60.5
All India	2238.3	3761.9	6000.2	25.0	31.6

Source :— IFFCO, Statistical Outline, 1983. pp. 23-29.

Development Situation in UP in brief

(i) Concerted efforts have been made to maximise growth of the state economy but the overall progress has not kept pace even with the national growth. From a position close to national percapita income in 1950-51, the state had fallen back to the level of 25 per cent below the national average in 1978-79. This state occupies

the second lowest position in the country, among the larger states—the lowest being Bihar.

(ii) The state planners explain or ascribe this relative lag to the state's inability to get the requisite momentum in respect of modern industry, decline in its share of power generation in the 70s and uneven economic growth in its different regions. Lately there has been a change for the better in the field of agricultural production—the growth rate of 1 per cent (1960-69) having moved upto 2.5 per cent per annum in the years 1968-76, the period of the Green Revolution—only relatively a good performance.

(iii) The per ha yields in the UP are as yet lower than the national averages for all major crops like paddy, wheat, sugarcane—far below those of the neighbouring states of Haryana and Punjab but somewhat better than those in Bihar. The available irrigation facilities are not being fully utilised; the cheapest groundwater potential is grossly under-exploited—agriculture still remaining rainfed largely, liable to severe fluctuations by drought and floods. The cropping intensity in UP during 1977-78 was 134 per cent—far below Punjab's 153.2 per cent and Haryana's 149.1 per cent that year.

(iv) A vast number of UPites are heavily dependent on small holdings in agriculture which are liable to vagaries of nature. Even though this dependence is 78 per cent, agriculture and allied sectors contribute only 51.5 per cent of UP's national product (all India figures being 72 per cent and 40.3 per cent respectively). The state planners hold that a low percapita plan outlay, a low percapita cenral assistance, plus an adverse credit-deposit ratio, are responsible for a low level of infrastructural development outside agriculture, slow industrial growth in the large non-organised sector and a comparatively lower level of public and private investment during the planning and nationalised banking era.

“The result is that there is a passive acceptance of an unchanging pattern of life, a belief in status quo and a pathetic, helpless faith in divine dispensation———. This emphasises the urgency of the need to change this situation through planned state action on an extensive scale—an essential prerequisite for releasing constructive and positive forces which would provide the main spring for rapid growth.”⁴

This expression of hope is somewhat tantamount to begging the real question; it is perhaps only a statement meant to draw attention towards a rational approach to the problem—an incomplete one at that since the main question would still remain : how to bring about so many things, for example, more irrigation; provisioning of inputs and facilities, advice and extension and what not—which should happen simultaneously, effectively, economically and purposefully, at the political and administrative levels ? The state would need a wilful, clearheaded, determined and very large hearted political leader at the top of affairs and an efficient bureaucracy to support him.

(v) In the beginning of the 6th Five Year Plan it was visualised that the aim of irrigated farming should be to harvest upto 3000 kg of rice, 3000 kg of wheat

and 1000 kg of summer 'moong' from one ha of land every year. Such a target, though technologically feasible, did not at all seem within practical range considering the prevalent levels of productivity in the state. The planners, however, ran away with this attractive idea and fixed the state target of agricultural sector growth at 5.5 per cent per annum even when the national target was fixed at only 4 per cent ! On strategy⁵ the following "objectives" were talked about, without indicating how the same were to be put on the ground :—

- (a) to increase the intensity of cropping in the eastern and Bundelkhand region by programmes of dry farming, mixed farming and intercropping ;
- (b) to provide ecological security for sustained agricultural advance by paying greater attention to the care of soil fertility and water quality etc.
- (c) to make effective use of every drop of water available both in irrigated and rainfed areas ;
- (d) to arrange coverage of fallow areas by suitable crops depending on the types and time of land availability ;
- (e) to arrange conservation of all farm produce through safe storage and appropriate use of post harvest technology ;
- (f) to bring about a satisfactory and scientific management of land and water ;
- (g) continuously to identify and analyse constraints and deficiencies prevailing in the crop production sector with a view to bringing about a substantial increase in productivity.

Let us now turn to specific items like Irrigation; Land Reforms, Rural electrification and Regional 'Imbalances'.

Irrigation

Provision of assured irrigation is a basic infrastructural facility for augmentation of agricultural production, always accorded a high priority in allocation of resources under any planned programme. In UP, from 1950-51 to 1982-83, cumulative expenditure on irrigation was Rs. 1539 crores creating an end irrigation potential of 67.23 lakh ha, starting with 25.33 lakh ha of preplan period, through major and medium projects. Another potential of 21.21 lakh ha was created under the state minor irrigation schemes. According to the Sixth Five Year Plan of the state, a minor irrigation potential of 34.81 lakh ha would be created in the state sector by the end of that plan with an expenditure of Rs. 687.16 crores from first plan onwards adding 3 lakh ha potential in the Sixth Plan. Thus by the end of 1984-85, a total potential of over ten million ha Irrigation would be available in the state under departmental programmes alone.

The progress of private minor irrigation in UP is in addition to this potential. As distinct from more than 20,000 state tubewells (covering average 120 ha each and to run for 2500 hours average in the year)—a scheme running into rather heavy losses due to poor utilisation, in turn due to power shortage—private farmers had

also sunk their own masonry wells, pumpsets, tubewells etc., over the years with own money or institutional credit from various sources, to build a sizeable potential of more than 6 million ha in the same period.

Poor utilisation of Irrigation potential available

Thus the total irrigation potential of UP upto 1979-80 was 16 mha, including 10 mha through Major and Medium and (State) M I works. But the actual utilisation of the potential was low at 63 per cent though from major and medium schemes it was 80 per cent, net irrigation was only 8.9 mha, that is, 59 per cent of the net sown area. UP's greatest basic asset is plentiful availability of surface and underground water. With progressive enhancement of irrigation potential, agricultural production should go up provided utilisation of the potential also improves. According to the state planners the total irrigation potential of UP is 355 lakh ha, including 215 lakh from surface water and 140 lakh from ground water sources.⁶ Some other calculations have revealed a smaller potential of about 260 lakh ha only from all sources.⁷ This is sufficient for providing irrigation intensity of the order of 200 per cent for the cultivated area of the state.

The ground water investigation organisation created in UP in 1970 prepares district and blockwise ground-water availability and utilisation reports and updates them from time to time, carrying out exploratory drilling and analysis of water samples for suitability. It also prepares appraisal reports for districts and block level groundwater capabilities for seeking financial assistance from institutions like NABARD, Land Development Bank and Rural Electrification Corporation. This organisation had 7 rigs only—four more were to be added in the 6th plan. Even then that amounts to too few rigs for a state of UP's size.

Apart from helping the state tubewell sinking programme the data collected by this groundwater organisation helps private farmers to have their own on-site tubewells individually or through community effort with the help of institutional finance. The number of private tubewells and the sources of irrigation from groundwater are on the increase because, in terms of opportunity cost of water at critical stages of plant development, these are extremely essential for supplementing the supplies available from canals and state tubewells.

The M.I. Directorate of the UP government provides the most important input of assured irrigation for cultivation of hyv seeds, increasing cropping intensity and agricultural production. Its agencies play an important role in creating quick irrigation facilities in areas where gravity canal irrigation is not feasible and render help to marginal farmers having small holdings who are not in a position to own their independent means of irrigation.

In spite of a big irrigation potential under M.I. the utilisation actually has been just over 50 per cent from 1977-78 onwards. In the case of M and M schemes, the utilisation is said to be over 80 per cent in the last three plan periods. This is creditable but the average utilisation of all irrigation potential lately works out to be just over 50 per cent.

The State M.I. works are confined to 20 ha at the lower limit while the private

M.I. works are confined to average 2 ha each. There is no agency to execute M.I. works in the range of 2 to 20 ha holdings. The gap needs to be filled considering the small size of holdings in the state.

In addition, there is a dire need of close coordination among all agencies and sectors concerned with M.I. and with rural electrification programme. This will help improve utilisation of the irrigation potential.

Land Reforms

The objectives of land reforms policy in UP have been firstly to remove such motivational impediments to agricultural production as arise from the agrarian structure inherited from the past and secondly to eliminate all elements of exploitation and social injustice within the agrarian system so as to move towards greater equality of status and opportunity for sections of the population."³ This enunciation of policy is flawless.

The starting point in UP was the passing of the UP Zamindari Abolition and Land Reforms Act 1950 according to which reforms were carried out in three phases :—

- (i) to abolish zamindari and jagirdari tenure, feudal rights over land primarily acquired through extra economic and political sanctions during the colonial rule; to eliminate a functionless parasitic class of landlords which was economically isolated from the production system and was morally rootless on account of its identification with colonialism
- (ii) to aim at creating basic conditions to increase agricultural production by consolidating the scattered land holdings;
- (iii) to impose ceilings on land holdings which sought to attack not just the principle and practice of unearned income (non-cultivating landlordism) but sought also to eliminate the right to hold beyond certain socially acceptable limits. As such, ceiling laws offended not only against the desire to own property but also cramped the commercial drive of big farmers and were strongly resisted by various means.

UP's Sixth Five Year Plan intended to attack absentee landlordism, collusive transfers with a view to evading ceiling laws, tendency on the part of urban rich to buy land and restoration of land alienated from tribals and other weaker sections.

The names of share croppers and other category of lease holders were to be registered in revenue records on such holdings with a view to providing them security of tenure and regulate the rents.

The area declared surplus so far was meagre—only 2.79 lakh acres out of which 2.22 lakh acres had already been allotted/settled. Financial institutions were to advance credit to the new allottees of land, with 50 per cent subsidy under the SFDA, not only to pay for the land but also to buy bullocks etc. for cultivation etc. It was further decided to associate committees of beneficiaries with the implementation of land reforms.

For a state of UP's size, the total surplus area declared so far was too little—only less than 3 lakh acres. For discovering the cases of benami transactions circumventing the ceiling laws, the 6th plan stated :—

“The present ceiling law entitles a person to retain 18 acres of Irrigated land with him and to hold 15 acres in addition if he has 3 major sons. It is every day's experience that in the face of this law since 1960, a good number of big farms have come to exist. This state of affairs is mostly due to benami and bogus transactions in the names of servants and fictitious persons. Such cases have to be located to be able to correct the records after enquiry.”⁹

This was hardly reassuring since strict and positive action was needed against defaulters and evaders. Instead, the planners suggested that

“With a view to making the present provisions of law more effective and to bring up the present legislation in conformity with present day concept of land reforms, it is proposed to undertake a survey on matters connected with various land reforms legislation at a cost of Rs. 5 crores.”¹⁰

Such a survey will only be a clear circumvention of the real task of enforcing the laws and its attendant difficulties. How long can one evade that enforcement? So far there has been a lack of political will to enforce the ceiling laws in right earnest.

Consolidations of Holdings

The progress of consolidation of holdings has been as follows in the Plan periods

	<i>Area consolidated (in Lakh ha)</i>	<i>Cost (in Lakh Rs.)</i>
First Plan	0.86	77.26
Second Plan	21.06	691.30
Third Plan	45.61	1120.40
Ad hoc Plan	21.53	1045.00
Fourth Plan	26.38	2311.00
	<hr/>	<hr/>
	115.34	52.45
Fifth Plan	26.33	44.19
Sixth Plan	19.50	51.50
(Target)	<hr/>	<hr/>
	161.17	148.14

Rs. in
(crores)

Total cultivable area in UP was about 200 lakh Ha.

The work was completed with the Fifth Five Year Plan. In the Sixth Plan, villages excluded from consolidation earlier were to be treated; some 25 tehsils of

23 districts were to be reconsolidated since rectangulation 'chaks' were not formed and no common land had been left for roads.

This progress was satisfactory; coupled with irrigation facilities mentioned already, this should give a spurt to agricultural production.

Rural Electrification

Though rural electrification is absolutely essential for farmers' tubewells and other agricultural purposes, UP has done rather poorly in this behalf. Only 33,577 villages out of 1,12,561 has been electrified by 1979-80 (34.30 per cent)—all India average being 43.5 per cent [The figures for the year 1982-83 were 53,367 villages or 47.4 per cent of total all India average being 55.7 per cent]. The percentage was lower only in MP, West Bengal, Bihar and Orissa. In Punjab and Haryana it was cent per cent. In TN and Kerala it was almost near 100 per cent by 1982-83. No wonder UP tubewells—state and farmer owned—did not work upto capacity.

In 1977-78 the per ha consumption of power in agriculture in UP was the highest in the western region viz., 135.8 kwh—lowest (13.4) being in Bundelkhand. In village electrification also, the western region led with 44.64 per cent, central and eastern regions having only 31 per cent.

Let us see the situation of agriculture in the state in earlier years.

The NCAER (National Council of Applied Economic Research New Delhi) had done a techno-economic survey of the state in 1965—commencing in 1962, and come to the conclusion that it was of paramount importance to realise and to make it the core of policy that agriculture is the key to economic growth of UP and even industrial expansion will depend on that.¹¹ The agriculture sector was to provide foodgrains for the people, raw materials to the industry and offer a viable market for industrial products. The Report had emphasised the full utilisation of irrigation potential; land was to absorb higher inputs of labour and materials, bringing larger area under multiple cropping, superior cropping pattern and much higher yields per hectare. The provision of adequate power and transport was also stressed.

The Report was surprised to find that though the state had considerable area under irrigation and also grew a number of cash crops, including sugarcane over large areas, the output per person was low—mainly due to low yield of crops. Backwardness (really depressed) in agriculture was due to small holdings, faulty cropping pattern, under-utilisation of water and other resources, lack of coordination among various state agencies in the matter of input supplies like power and fertilisers.

The effect of planning between 1951-61 on the state of UP was not very heartening. Whereas national income in this period had risen by 43 per cent, in UP it had gone up only by 24 per cent. National per capita income had improved by 17 per cent but in UP increase was only 6.2 per cent—from Rs. 281 to Rs. 298. It was partly due to relatively smaller investments in UP—Rs. 109/-per capita as compared with Rs. 258 all India.¹² Though Rs. 61 crores had been spent on major and medium irrigation and a potential of 42 lakh acres was created, the net irrigated

area remained static. It was due to a poor utilisation of the available potential which had been created.

Foodgrains production in the decade 1951-60 had increased from 116 lakh tonnes in 1950-51 to 143 lakh tonnes in 1960-61—viz., only 23% increase in the years, compared with 46% all India. Per acre yield of wheat and rice registered some increase while that in Jowar, bajra, barley and maize it had declined. Other sectors of the economy in UP were grossly underdeveloped, since even in 1960-61 there was 68% reliance on agriculture for its income (compare 52% only in all India) and agriculture itself also was not looking up in UP in spite of its many advantages. The Report said :—

“The state enjoys certain physical and climatic advantages conducive to development of agriculture which are denied to other neighbouring states. The vast gangetic plain consisting of thick alluvial soil is one of the most fertile tracts of the country. Rainfall in most parts of the state, though not fully adequate for the year round cultivation, is much higher than in the adjoining states of Punjab, Rajasthan and MP. Irrigation facilities have been developed on a fairly good scale. Viewed against this background, agricultural development has not been commensurate with the facilities.”¹³

This was written in 1962-63. Even then the net irrigated area in UP was 29.3% (compared with 17.7% in India) and double cropped area was 26.9% of net sown area, as compared with 14.1 per cent all India. Low value foodcrops, coupled with low productivity of food and cash crops had led to low productivity of land in general. This will be clear from the following table of comparative yields for the year 1958-59 :—

TABLE 26
Comparative Yield of Crops, Some States Compared (1958-59)

(In lbs. per acre)

Item	Rice	Wheat	Jowar	Bajra	Grains	Sugar cane	Potatoes	Maize
All India	816	701	457	304	616	3316	6319	649
UP	655	712	609	469	585	2508	6458	514
Punjab	927	959	156	256	831	3153	12528	904
AP	1119	199	454	482	255	8394	4480	576
Bombay	916	510	463	299	313	5953	8565	1109
Madras	1293	560	663	555	560	5973	6827	896
Rajasthan	970	788	275	220	654	1966	2987	832

Source : Report of the NCAER, 1959, p. 20.

For the low yields, the most important factors were held to be the backward techniques of production, inadequate supply of plant nutrients, water and soil erosion, alkali formation in some soils, water logging and lack of credit facilities to the farmers etc. According to the Report, small size of holdings (then 1.05 ha average) could not answer all these inadequacies since area under them was then small. Infact, it was felt that intensive cultivation should result in higher yield per acre in small holdings.

The NCAER felt that there was little coordination between irrigation and agriculture; there was more emphasis on irrigation schemes than on their utilisation (for example no field channels were constructed in time); there was neglect of cropping pattern aspect and lastly there was only a thin spread of the CD/extension agency and inadequate contact with the cultivator who had been provided with inadequate credit and marketing facilities.

Even upto 1981-82, the position was not satisfactory. Inspite of such a big irrigation potential already created in the state, its utilisation was low. Again, inspite of the relative increase in the consumption of fertilisers, the yield of food-grains remained pretty low, even lower than all—India averages generally. Among big states, only Bihar was lower than UP. For example in 1981-82 UP produced 1078 kg/ha of rice and 1641 kg/ha of wheat against all India averages of 1317 and 1696 kg/ha respectively.

Regional Imbalances

UP is divided into five regions, partly for convenience of planning, partly for natural distinctions. The regions are Western (19) Central (9), Bundelkhand (5),

TABLE 27
UP's Regional Imbalances—Total & Per Capita Output (1976-77)
(at current prices)

<i>Region</i>	<i>No. of districts</i>	<i>Population %</i>	<i>Net-sown area ('000 ha)</i>	<i>Total output in Rs. Crores</i>	<i>Per Capita output in Rs.</i>	<i>Density of population</i>
Western	19	35.97	6049.6	2119.12	606.14	447
Central	9	17.78	3060.6	911.28	524.60	395
Bundelkhand	5	4.94	1833.7	286.89	555.41	178
Eastern	15	36.88	5778.4	1479.57	402.20	438
Hilly	8	4.43	699.5	303.78	708.28	88
Total	56	100.0	17421.8	5080.64	520.16	346

Note : Western region in leading in total and per capita output, ignoring the hill region in which income from outside plays a big part. The eastern region in the most backward.

TABLE 28
U.P. Regions—Interse Development Compared (1978-79)

Items	Unit	Western	Central	Eastern	Bundel- khand	Hilly	UP total	
1 Population percentage	%	35.97	17.78	36.88	4.94	4.43	100	1979
2 Population/Density	Nos	447	395	438	178	68	396	Persons per sq. km. 1977-78
3 Net area Sown	'000 ha	6049.6	3060.6	5778.4	1833.7	699.5	17421.8	
4 % of net area Sown to total reported area	%	73.41	66.04	66.09	61.08	13.52	58.47	1977-78
5 % of small and mar- ginal farmers	%	80.77	87.13	90.82	64.35	12.82	85.77	1976-77
6 % of area under small and marginal farmers	%	41.1	52.62	54.62	22.52	46.22	45.56	1976-77
7 No. of private electri- fied pumpsets/tubewells	Nos	1,81,954	38,778	1,16,466	3611	3295	3,44,104	June 1980
8 Consumption of power in industries as % of total	%	45.78	64.05	69.03	51.44	72.93	59.75	1977-78
9 Length of pucca roads per lakh of population	KMS	42.2	49.4	46.3	80.2	238.6	53.6	March 1979
10 Value added per industrial worker	Rs.	9451	7869	9601	1302	17389	9098	1976-77
11 No. of workers in regd. Ind, establishments per lakh population	Nos	588	981	256	130	283	500	1976-77

1	2	3	4	5	6	7	8	9
12	Credit Deposit ratio	%	51.25	52.79	35.47	29.12	32.34	45.13 Dec. 1978
13	Gross value of agri. produce per net ha							
	of area sown	Rs.	3314	2644	2401	1494	3306	2703 1976-77
14	Intensity of cropping	%	139.97	128.97	135.05	109.88	159.65	134.02 1977-78
15	Percapita consumption of electricity	kwh	82.3	82.0	91.7	23.1	78.3	82.3 1977-78
16	% of electrified villages to total	%	44.64	30.93	29.95	21.76	21.15	32.25 1977-78
17	Junior basic schools per lakh population	Nos	62.57	66.81	61.47	93.73	139.75	67.89 1978-79
18	Senior basic schools per lakh population	Nos	10.21	11.77	9.99	14.89	22.80	11.20 1978-79
19	% scarcity villages to total	%	23.46	18.84	31.22	61.80	59.13	32.83 1972
20	% urban population to total	%	18.2	17.5	8.3	14.7	14.4	14.0 1971

Source : UP's Draft 6th Five Year Plan Review, 1980-85, Vol. I p. 126-127.

TABLE 29
Progress of Agriculture in Western UP Compared with Eastern

Division	Fertiliser consumption (lakh tonnes)		Area under hyv rice (lakh ha)		Area under hyv wheat (lakh ha)		Production rice (lakh tonnes)		Production wheat (lakh tonnes)		Total Production foodgrains (lakh tonnes)	
	1974-75	1982-83	1974-75	1982-83	1974-75	1982-83	1974-75	1982-83	1974-75	1982-83	1974-75	1982-83
Meerut (Western region)	0.97	2.21	0.70	1.28	6.69	7.11	1.42	2.29	11.30	20.45	16.56	26.96
Varanasi (Eastern region)	0.59	1.36	1.27	2.05	2.12	4.90	3.39	6.12	3.39	10.57	13.03	22.16
Gorakhpur (Eastern region)	0.66	1.50	3.93	5.61	5.63	8.83	8.21	10.85	7.48	16.23	20.50	29.97
Faizabad Part eastern	0.49	1.59	3.55	5.15	3.85	7.89	6.12	9.76	6.43	15.44	18.92	29.96
UP as a whole	4.87	14.27	14.25	24.49	41.52	65.48	34.53	55.26	71.76	152.86	162.28	263.52

Source :— "The Rising Production in Eastern UP", Sunday 15-21 Apr. 82.
A Report by Samitra Banerji and Satish Bhartiya.

TABLE 29A

Sourcewise Irrigated Areas in Eastern and Western Regions and UP State

(in 000 ha)

Region	Year	Canals	Tubewells	Others	Net irrigated area
Eastern	1964-1965	303	225	1553	2,081
	1981-1982	829	1850	380	3,059
Western	1964-1965	1149	467	705	2,321
	1981-1982	1256	2656	526	4,438
UP Total	1964-1965	2225	717	2,548	5,490
	1981-1982	3203	5,170	1,168	9,541

Source :—Dr. BN Tyagi Director Agricultural and Crop Insurance UP.
A Study of Agricultural Development, Eastern UP. p. 8 Nov. 1983.

Eastern (15) and Hilly (8) — the brackets indicate the number of districts in that region. The convenience of planning gets reflected in continuity, cropping pattern, geographic and economic factors.

Let us see some statistics of regional imbalances in preceeding 4 Tables (27 to 29 and 29A).

The western region comprises 19 districts including the whole of Agra, Meerut, Bareilly and Moradabad divisions and Etawah and Farukabad districts of Allahabad division. The central region has 9 districts, viz., six districts of the whole of Lucknow division and Kanpur and Fatehpur districts of Allahabad division and Barabanki in Faizabad division. The eastern region's 15 districts constitute the whole of Gorakhpur and Varanasi divisions, a major part of Faizabad division and Allahabad district of Allahabad division. The Bundelkhand region consists of all the five districts of Jhansi division while all the five of Garhwal division and three districts of Kumaon division comprise the hill region. It will be seen that the regions do not comprise complete administrative divisions of the state.

The western region comprises the western part of Gangetic plains and a small strip of the sub Himalayas—a very fertile land with alluvial soil interspersed with saline and alkaline soils. It has a tropical climate favorable for agriculture. The central region represents the central Gangetic plain, generally fertile and alluvial soil with some saline and alkaline lands. It has tropical monsoon climate, fit for agriculture. The eastern region comprises the eastern part of the Gangetic plain traversed by the Ganga, Ghagra, Gandak and Gomti rivers and their tributaries—often creating a broad flood plain in several districts in the rainy season. It has alluvial soil—and chunks of alkaline and saline lands—the fertility of the soil makes it fit for agriculture; a typical monsoon climate. Bundelkhand region consists of the southern hills and part of central India plateau, south of Yamuna. The soils are black and mixed

red, like in Madhya Pradesh. Water table is deep and annual rainfall is low. The land is not fit for agriculture. The hill region lies mainly in the greater and lesser Himalayas and partly in the sub Himalayas. It has a rugged topography with a few valleys between ridges and the sub mountainous plateaus in Dehradun and Nainital districts. Uniformity of conditions is not found in the region; it has great variations in altitude, rainfall, vegetation, soil structure, density of population etc. Soils are shallow and immature, varying in depth and texture. The plains of Dehradun and Nainital are fertile and weather conditions fit for agriculture.

Wide variations between the regions can be studied under three heads as below :

A. *Variation in natural resources*

(i) Land is the most important natural resource of the state and the eastern region has the largest part of it. But the cultivation percentage in the total reporting area of that region is only 66.08, as compared with 73.41 and 66.04 of the western and central regions respectively. In Bundelkhand it is 61.08 per cent and only 13.52 per cent in the hilly region. (ii) The percentage of the gross irrigated area to gross area sown in the state was 42.87 in 1977-78, the highest per cent of 57.91 being in the western region and lowest 22.40 per cent in Bundelkhand region. In 1979-80 as much as 56 per cent of the total irrigation potential in the state came from the M.I. works ; the canals accounted for 33.09 per cent—the State tube wells provided 13.86 of the total potential in the eastern region, compared with 12.52 per cent in the western and 5.21 per cent in the central (iii) The percentage contribution of private minor irrigation works to total irrigation potential was almost the same in all regions (around 55) except in the hill region (44.45 per cent only). What was most revealing was the fact that the western region utilised the highest per cent (49.32) of its underground water in April 1979 whereas large amounts of water were available in other regions of the state remaining untapped ; highest untapped potential being in the eastern region (83.99 per cent).¹⁴

B. *Variation in Levels of Infrastructural Development*

(i) The western region had the highest (Rs. 3314/-) gross value of agricultural produce per hectare of net area sown in 1976-77. (ii) The intensity of cropping was highest in the hill region and lowest in Bundelkhand region. (iii) The per capita consumption of electricity in 1977-78 was the highest in the eastern region (91.7 kwh), and lowest (13.1) in Bundelkhand, as compared with 163 kwh in Haryana and 226 in Punjab. The high per capita consumption in the eastern region was due to the location of an aluminium plant and some cement factories in the region. (iv) Per hectare consumption of electricity in agriculture was the highest in the western region (135.8 kwh) and the lowest (13.4 kwh) in Bundelkhand region.

C. *Variations in Levels of Economic Development*

44.64 per cent villages of the western region had been electrified by March 1979

—highest in the state. The percentage for the central and eastern region was 30.93 and 29.95 respectively (Compare cent per cent electrification in Punjab and Haryana). The length of pucca roads per thousand sq.km. of area in March 1979 was 211 k.m. in hill region and 137 k.m. in Bundelkhand region—the highest and the lowest. In respect of length of pucca roads per lakh of population, the hill region (238.6 km) was far ahead of others—the state average being only 55.6 k.m. The western region with 42.2 k.m. was the last of all the regions.

The lopsidedness of development is clear. It has not taken place to yield the optimum advantage to the state in respect of the investments made. The groundwater has not been fully developed even though it costs much less per hectare to create new irrigation potential than under major and medium irrigation projects; the roads have been inadequately laid even in the regions most productive agriculturally.

At the outset the eastern region of UP was neglected because priority was given to other areas which already had a momentum of development; this was, perhaps, more profitable from the angle of investment. The traditional agrarian structure was also such as to restrict the place of improvement in the eastern UP. The abolition of zamindari in this region had different results, in as much as the disappearance of the enterprise of large cultivators and certain services/organisations provided by zamindari were not adequately replaced by the initiatives of the small holders nor of the cooperative or C.D. organisations. The smallness of the holdings inhibited the use of the type of assistance given by the government, for example in the matter of loans for minor irrigation and fertilisers for which security was a basic condition before the loan was extended. The occurrence of floods and drought further complicated matters. On the other hand, in the western region, the abolition of zamindari had stimulated the growth of a thriving peasantry.¹⁵

Fertiliser Use

In spite of the recent big spurt in the use of chemical fertilisers, its consumption is still low relatively. It is much lower in the eastern region. But the significant manifestation of the application of improved technology in agriculture is through the change in cropping pattern, from low yielding crops to hyv and from single crop to multiple cropping. Even in the eastern UP cultivation of wheat has now shot up, though rice still remains the main crop of the region because of expansion of canal and tubewell irrigation providing assured water for the crops. Wheat has replaced barley and pulses and a certain amount of commercialism in agriculture has started to become visible there. These are good signs. But the fact remains that the eastern region is characterised by its predominantly marginal and small holdings which are being further fragmented with growing population and families. The 1976-77 census showed an average holding of .78 ha, as compared with 1.05 ha in the state as a whole. This means less surplus production and smaller investment in land. Small holdings—a large part thereof—may not have or be able to afford even the barest minimum facilities for cultivation.¹⁶ The situation is made worse by the recurring floods and drought in the region and the persisting fact that the high caste

land owners of the region—Brahmins, Thakurs and Kayasth's—do not handle the plough and depend on hired labour for cultivation, making schemes less effective.

Some Suggestions : General

(1) The western region is the more developed in respect of agriculture and industry. It could turn to cash crops to augment incomes and take up agro-industries.

(2) Central region has large tracts of cultural waste which could be improved and brought under the plough. Here the intensity of cropping also is far below the state average. More irrigation and better cropping pattern are needed.

(3) Most of the areas in the state, except Bundelkhand and Vindhyan regions, have a good scope for development of ground water resources. This potential should be tapped to the maximum—about 80 per cent is still remaining untapped. It is a very cheap source of water. Of course, the programme of rural electrification has to be coordinated with it.

(4) Productivity in the state is very low, especially in foodgrains. There are no inherent soil, climatic or other physical reasons for the present low yields; these could be significantly improved through intensive effort by combining all technical improvements and by concentrating all available expertise and other resources in areas which lag behind. The successful example of the "package" concept is there to follow.

It may be observed here that each backward area represents a unique combination of factors and it is not possible to suggest any uniform policy of development. In order to accelerate growth, appropriate location of specific strategy based on the causes of backwardness will have to be identified.

(5) The UP state is too big to be managed as a single unit of administration. It will be advisable to consider splitting it up into three or four independent units—at least, for development purposes. Experience shows that in a democratic set up, smaller units perform better mainly because in them the intensity of administration is more efficient and better and political leadership is more able to assert its will on the bureaucracy and the people. More in chapter 10 later on.

For Eastern Region

1. Harness the 5 rivers—Ghagra, Gandak, Rapti, Gomti and Ganga to save net cropped area for cultivation. Large scale afforestation in their upper catchments will be required to check erosion and consequential floods. Desilting of the rivers and their tributaries could be undertaken within the resources available, bearing in mind the upper and lower riparian rights.

2. The two canal systems—Sharda Sahayak canal and Gandak canal—have led to increasing recharge of the sub-surface water leading to water logging. Low utilisation of groundwater has accentuated it. The answer lies in intensive exploitation of groundwater in the region—the present use thereof is only 15 per cent—and the construction of an effective drainage system, including desilting of the existing

drains. The seepage from the running canals will have to be tackled through lining, especially in areas where soil structure is porous. Punjab experience is a guide.

3. Non or underutilisation of available irrigation facilities by farmers during Kharif has to be checked. During 1981-82, gross irrigated area in Kharif in this region was only 5 lakh ha, as compared with 28 lakh ha registered as rabi irrigated area. [In the same year in the western region the figures correspondingly were 10 lakh ha and 36 lakh ha, though in some western districts, kharif irrigation was almost as much as rabi irrigation]. Demand for irrigation water in kharif being more uncertain than in rabi, the state government decided to close the canals only for 3 weeks during the rabi harvesting season—as against 2 months previously.¹⁷ Other ways and means including incentives, education and extension will have to be found for encouraging canal irrigation in kharif as well as through private tubewells so that the production of crop does not remain tied with the vagaries of the weather.

4. The point about groundwater exploitation has been touched above indirectly. The present per centage of utilisation needs to be improved. In some districts in western region there is exploitation of 60 per cent and more of ground water. The eastern region will have to be coaxed into this programme with subsidies and financial help—all the more by expediting the consolidation of small holdings and stopping further fragmentation thereof. Preference for small and marginal farmers will still remain valid for loans etc. In the overall, the lending norms may be more relaxed for the eastern region as the investment capacity of the farmers of this region is very limited.

5. Rural electrification will need to be spread in the region quickly—which will help groundwater exploitation and agriculture, by earmarking a bigger quota of power for it.

6. Whereas wheat has received a good push in the eastern region in the last few years, low land paddy cultivation and its productivity in the region has suffered from neglect. No technological breakthrough has been achieved in this in the last many decades—so also in pulses and oil seeds. Research and extension need to be focused on paddy yields in this region.

7. A low resource base of cultivation in the eastern region leads to low investment, low capital formation and still lower investment and low risk-bearing capacity of the farmer. Diversification of production in the farm sector, changes in cropping pattern, special schemes for financing should be thought of, alongwith improvements in marketing infrastructure as well as augmentation of the rural road construction programme.

8. The extension machinery in these areas has to be considerably strengthened and improved to act as an effective agent of taking the technology from the lab to the field. The training and visit (T and V) system should be introduced immediately if not already done and responsibility fixed for achieving in time results at various levels of administration.

9. The low level farm productivity in the region and low growth rates with wide variations from district to district have to be tackled with vision and persistence. The agricultural economy of the region, highly foodgrains based, will have to be diversified by a sizeable support from the state and the institutions.

Post Script

In the UP's Seventh Plan, emphasis has again been laid on accelerated growth and mobilisation of resources. Approved outlay for this next Plan is Rs. 11,000 crores—that is, about 77.4 per cent higher than the size of the state's Sixth Plan. It has been claimed by the State Planners "that the increase in agricultural production during the Sixth Plan period has been encouraging and notable in the case of wheat and reasonably satisfactory for rice. In the case of pulses and oil seeds, it has been below expectations. The emphasis in the Seventh Plan will be on *more efficient management of inputs* including irrigation, fertiliser, credit and reduction in disparity in the production level of different crops in different regions of the State."¹⁸

It has been recognised that in any case there are not any magical solutions to the pressing and growing problems of the state which constitutes about 1/6 of the nation's population. The "non magical" solutions have not been spelt out either except laying stress on a *more efficient management of inputs*—but how? It is rather, difficult to conceive such management in view of the huge size of the state and the current working environment and the work ethic of citizens of this state. It is in states like U.P. and Bihar that the relevance of administrative support, from the political level downwards, to the success or otherwise of the green revolution becomes particularly acute. A lack of such support leads to infructuous expenditure, lopsided effort, uncoordinated growth strategies in the short run and an overall disillusionment in the long run.

NOTES

1. Mohd. Shafi, "Agricultural Productivity—Regional Imbalances". CONCEPT, New Delhi, p. 44.
2. Indian Agriculture in Brief. 1982, pp. 186-187.
3. Venkateswarlu, *Ibid.*, p. 268.
4. UP's Draft Sixth Five Year Plan (1980-85) Vol. I, p. 47.
5. UP's Draft Sixth Five Year Plan (1980-85) Vol. I, p. 207.
6. Draft Sixth Plan UP (Review), p. 329.
7. Tata Services—Statistical Outline of India, 1984.
8. Draft Sixth Five Year Plan UP (Review) Vol. 1, p. 235, 1980-85.
9. UP Sixth Five Year Plan, *Ibid.*, p. 239.
10. UP Sixth Five Year Plan, *Ibid.*, p. 239.
11. NCAER Report—UP's Techno Economic Survey Report, 1965, p. vii.
12. NCAER Report—UP's Techno Economic Survey Report, 1965, p. 26.
13. Report of the NCAER—*Ibid.*, p. 20.
14. Draft Sixth Five Year Plan UP. 1980-85, Vol. 1, p. 121.
15. "The Rising Production in Eastern UP," 'Sunday' weekly Magazine, Calcutta, 15-21 April 1984.
16. "On account of small size of holdings, a large number of such holdings do not possess even the base minimum facilities for an average level of crop husbandry, viz. a pair of bullocks, plough, an irrigation well etc.—In the eastern region, out of 5.72 m. marginal holdings only 2.89 m. holdings possessed male cattle over 3 years age—About 50 per cent holdings of marginal and small categories combined together did not possess the bare minimum facilities for cultivation."
 Source :—Dr. B.N. Tyagi—Study of Agricultural Development in Eastern UP, Directorate of Statistics & Crop Insurance UP, Lucknow Nov. 1983, p. 8.

17. Dr. B.N. Tyagi Director Agricultural Statistics and Crop Insurance UP, Lucknow, suggests the following in his "Study of Agricultural Development in Eastern UP"—Nov. 1983 : pp. 16-17.
"Irrigation for Rice : Rice is the most important Kharif foodgrains crop of this region. For better yields, rice crop should be planted in the fields before the commencement of the monsoon. This would require two waterings in the fields. The canals must therefore run from the 1st of May to 30th of June. When the monsoon commences and the rainfall is adequate only then repairs should be carried out. The crop again requires irrigation facilities after 15 Sept. when the monsoon generally withdraws. Thus the canals must provide water in the months of Sept.-Oct. to the standing Kharif Crop. In Tarai areas, farmers usually irrigate their rice crop four or five times in spite of normal monsoons and get 2500-3000 KG per ha. The canal system thus needs to be geared to the needs of the rice crop in the eastern region. There is no dearth of water in the two canal systems. The farmers will, of course, change their practices only when they are convinced of the availability of water in the canals."
18. UP's Seventh Plan—A two column Ad. in the Times of India 4.8.85, in the name of K.L. Mukherjee.

Impact on Bihar

Basic Statistics¹

Area 1,74,000 sq. km. (5.3 per cent of India's).

Population (1981) 69.82 million (10.21 per cent of India's).

Three distinct agroclimatic zones in the state viz.,

- (i) North Bihar, area 52,800 sq. km. (30.9 per cent of the state) with 26.5 m. population.
- (ii) South Bihar plain area 40,400 sq. km. (23. per cent of Bihar) with 15.8 m. population.
- (iii) Chhota Nagpur plateau area 79,700 sq. km. (45.8 per cent of Bihar) with 14.2 m. population

Density of population zonewise 489,392 and 178 respectively.

Density in the state as a whole 324.

Gross cropped area 113 lakh ha—of total area 174 lakh ha.

Per capita net cultivated area is only 0.15 ha, as against 0.26 ha all India.

Out of 75.77 lakh holdings of the state, 64.34 per cent consist of tiny strips of less than 1 ha, 14.64 per cent between 1-2 ha, both counting for 30 per cent of the total operated area. Majority of farmers are small and marginal, subsisting on very low earnings from land, with no resources of their own for land development. There is a concentration of scheduled castes/tribes in the state—both being 22.9 per cent of the population (1971), as compared with all India average of 21.5

per cent. Population of the other socially backward classes is also sizeable.

Zonal Characteristics

(i) *North Bihar plain* is a monotonous flat fertile region interspersed by rivers/streams going south to the Ganga. This is an area of great instability and recurrent floods. It is mainly rural viz. 94.8 per cent. Recently a few industries like Barauni Refinery Complex have come up. Sugar Industry is languishing for lack of investment in modernisation. Infrastructural investment is in any case inadequate. Power availability was only 16.4 kwh in 1980 as compared with 96.4 kwh for the state as a whole (per capita consumption). The zone has 50 per cent of the total scheduled castes and tribes population of Bihar. It is an area of endemic poverty, backwardness and unemployment.

(ii) *South Bihar Plain* a relatively more stable region, very fertile with maximum benefit of irrigation. In 1975-76 gross irrigated area was 57 per cent of gross cropped area (as compared with 23 per cent in North Bihar and 9 per cent in Chhota Nagpur). It has only a moderate population density. Annual per capita consumption of power is 48.2 kwh. Number of villages electrified is 27 per cent as compared with 10 per cent in North Bihar and 6 per cent in Chhota Nagpur. Certain areas of the zone are exposed to recurrent drought.

(iii) *Chhota Nagpur Zone* is undulating land of which only 30 per cent is utilised. The area is not fertile though it does not suffer from floods or drought. It is poorly served by irrigation; all agriculture is rainfed. It needs more irrigation facilities and soil conservation measures to improve productivity. The zone is full of mineral resources—90 per cent of Bihar's minerals are here. 92 per cent of its population consists of scheduled tribes.

Overall Economy of the State

Net per capita Income at current prices in 1980-81 was Rs. 870/- against Rs. 1537 in the country (average). It had been deteriorating over the years. See Table below :²

TABLE 30
Bihar's Net Percapita Income (Rupees at Current Prices), Compared with All India

Year	All India	Bihar	Difference %
1972-73	710.6	480.01	—32.7
1976-77	1048.6	699.7	—30.3
1977-78	1210.0	741.0	—38.8
1978-79	1250.0	773.0	—38.2
1979-80	1316.0	795.0	—39.6
1980-81	1537.0	870.0	—43.4

The state planners claim that "such a situation has been brought about by lower availability of resources. With a low income base it cannot mobilise its own resources. Resources have to be transferred by the Centre. Per capita investment in the state and per capita central assistances to Bihar have been both below all-India averages". This is partly true also.

In aggregate terms, between 1960-61 and 1977-78, Bihar's income increased, at an annual compound rate of 2.50 per cent (at 1970-71 prices) as compared with the growth rate of 3.48 per cent in the country. The gap between per capita national income and per capita state income has been widening over the years, as shown above. As for the level of absolute poverty, it has increased from 60.76 per cent in 1973-74 to 75.06 per cent in 1977-78 (See Bihar's Memorandum to the 8th Finance Commission). The situation regarding unemployment is equally dismal. The volume of unemployment at the end of 1977-78 was estimated at 22.10 lakh man years. The NSS data shown in their 28th round (1973-74) and 32nd round (1977-78), read with the Planning Commission's revised norms of minimum level of expenditure, the per cent of people below the poverty line was 75.26 in 1973-74 in the rural areas and 50.54 in the urban areas, viz. 60.76 per cent of the total population. This percentage has since increased.³

According to the 6th Plan document of the state the problems of development in Bihar are essentially problems of slow growth, lack of diversification and recurrent exposure to vagaries of nature, endemic poverty and mass unemployment. The state planners have stated hopefully that three decades of planned development have laid the foundations of accelerated growth in future, initiated a process of diversification of the economy and modernisation of principal sectors and increased the capacity to withstand the vagaries of nature. Given the necessary investible resources the vast unutilised and underutilised manpower especially in rural areas can be formed into a strong base for achieving a faster rate of growth of the economy".⁴

TABLE 31
Per capita Plan Outlay and Central Assistance for Bihar (in Rupees)

Plans	Per capita outlay (in Rs.)		Per capita central assistance	
	Bihar	All India	Bihar	All India
First	25	38	5	24
Second	40	51	18.75	26
Third	67	92	43.0	55
Fourth	85	142	57.0	99
Fifth	230	358	84.0	101
Sixth	572	872	NA	NA

Source : Draft Annual Plan (1983-84) of Bihar.

The per capita investment and per capita central assistance to the state during different plan periods have been pretty low—lower than the average for all states. See Table 31 prepage.

Besides central assistance, resource transfer through ad hoc mechanism from the centre, share of central sector schemes, share of market borrowing, long and short term credit by financial institutions etc., have not matched its needs. Even the royalty from minerals did not amount to much (only Rs. 31 crores in 1981 from a production worth Rs. 838 crores), even though the state happens to be the richest in mineral.⁵ Industrial development received a low priority in result. The comparative cost advantage, as revealed in its rich minerals endowments, thus did not accrue to the State. There has also been less and less investment in the development of infrastructural facilities e.g. power and transport, road and rail and communications in general. The state has virtually suffered from neglect, indifference and lack of real effort. Its problems were not treated with courage, conviction and adequate effort, partly due to the fact that no strong political leadership emerged in the state to take its people towards a fruitful objective.

Agriculture

Overwhelming dependence of the state is on agriculture which is neither stable nor efficient. In 1977-78 (at 1976-77 prices), the percapita value of output of food grains per ha was Rs. 286—the lowest in the country. In the same year the comparable figures for Punjab and Haryana were Rs. 1779 and Rs. 1172 respectively. Bihar has the largest per cent of agricultural labour among the total number of workers; this percentage has been increasing. In 1979 it was 38.9 per cent in Bihar against all India's 26.3 per cent.⁶ The size of operational holdings in Bihar declined by 26.7 per cent from 1.5 ha in 1970-71 to 1.1 ha in 1976-77. The decline at all India level was only 12.3 per cent. As indicated already 78.98 per cent of land holdings are with small and marginal farmers, accounting for only 29.71 per cent of total area. In result, the net cultivated area *percapita* in 1971 was only 0.15 ha in Bihar, as compared with the all India average of 0.26 ha. The owners have little or no resources of their own for land development or to pay for high costs of inputs for raising productivity.

It is the development of these small and marginal farmers that holds the key to agricultural progress in the state and removal of poverty. Of this more later.

Foodgrains' production in the state in 1978-79 was 102.6 lakh T. It fell to 70.16 lakh T. in 1979-80 (drought year), went upto 106.40 in 1980-81, followed by 97.85, 120.0 and 124.0 lakh Tonnes in the three succeeding years respectively. Statistics on next page regarding average production depict a sorry state of affairs. (Table 32)

It will be seen that whereas some progress is there in the production and productivity of wheat in the recent years, there is a good deal of uncertainty in the productivity of rice. There is progress in the overall production of foodgrains but only marginal. Hopefully the state planners were proposing to raise foodgrains production to 136 lakh T by 1984-85, from 106 lakh T. in 1980-81, at a growth rate of 5 per cent p.a.—Rice from 56 lakh T to 63 lakh T, wheat from 27 lakh T to 45 lakh T and pulses from 6.80 lakh T to 9.50 lakh T. They even claimed that ;

"new techniques for increase in out-put are being evolved by the ICAR and Rajendra Agricultural University Pusa, Patna. They are being disseminated to the cultivators, through various extension activities training and demonstrations. This has resulted in an increase in the coverage and production of foodgrains and cash crops."

TABLE 32
Area, Production and Productivity of Foodgrains in Bihar

	Area in ('000 ha)		Production ('000 Tonnes)		Productivity in kg/ha		Production ('000 T) 1980-81	Productivity (kg/ha) 1981-82		
	Average of quinquennium ending	Average of 4 years ending	Average of quinquennium ending	Average of 4 years ending	Average of quinquennium ending	Average of 4 years ending				
Crop	1974-75	1978-79	1974-75	1978-79	1974-75	1978-79	Production	Productivity	Production	Productivity
1	2	3	4	5	6	7	8	9	10	11
Rice	5173	5434	4351	5141	843	947	5635	1015	4260	785
Maize	868	891	744	920	830	1030	NA	NA		
Wheat	1444	1853	1919	2391	1212	1326	2306	1314	2569	1473
Total Pulses	1555	1462	746	725	504	477	833	609	780	571
Total Food-grains	9635	10184	8093	9463	840	929	9911	989	8591	872

Source :—Draft Sixth Five Year Plan Bihar, p. 8 [Columns 8 to 11 based on Indian Agriculture in Brief 1982, 19th Edition].

Irrigation

Irrigation potential under major and medium category was 4.09 lakh ha in 1951. By 1982-83, it was 27.24 lakh ha. The *maximum* possible irrigation potential by

major and medium sources is estimated at 92.30 lakh ha of which not even 30 per cent has so far been exploited. The potential created by minor irrigation sources upto 1982-83 was 28.14 lakh ha against the ultimate estimated potential of 59 lakh ha. Let us analyse the situation further, with figures from Bihar's Annual Plan 1984-85 :

(i) *Major and Medium Irrigation : (M & M)*

Total ground area	17.35 mha
Culturable area	11.50 „
Irrigable area	9.23 „

By 1979-80 irrigation potential of 2.452 mha was created through major and medium projects which accounted for 21 per cent of the cultivable area and 27 per cent of the *irrigable* area. The VI Plan intended to add to it a potential of 6.65 lakh ha—later reduced to 5,32,000 ha due to hike in prices. This would raise the overall potential by the plan end to 2.984 mha or 26 per cent of culturable area and 30 per cent of irrigable area. This showed that the annual addition to the potential was only one lakh ha. The VI Plan allocation (Rs. 850 crores)—was too little for the purpose.

Then there was a big gap between the potential created and the potential utilised, largely because of nonavailability of water courses and field channels. Against a created potential of 2.452 mha, utilisation upto 1979-80 was only 1.72 mha, going upto 1.877 mha by end 1981-82, against a potential of 2.609 mha.

(ii) *Minor Irrigation (M.I.)* by 1982-83, the total potential created in M.I. would be 2.816 mha. The whole of the north, except for a small area in the north of west Champaran district, is capable of a high yield of groundwater. The gangetic alluvial tract of south Bihar has also a good yield of ground water. Besides there are a number of perennial rivers and streams in this area.

Approved VI Plan outlay for M.I. (1980-85) was Rs. 168.7 crores. Taking into account other allocations from sources like Command Area Development Agency etc., a new potential of 2,40,980 ha would be created in the year 1983-84 alone through surface and ground water sources—making a total of 3.054 mha minor irrigated area by end 1983-84.

[To note; with an allotment of Rs. 38 crores under M.I. in the year 1983-84, a potential of 2,40,000 ha was created, as compared with a potential of a little over 100,000 ha to be created under M & M with an allotment of Rs. 192 crores.]

In volumetric terms the creation of irrigation potential has been commented upon as under in the state's Draft VI Five Year Plan (1980-85) :—

“One of the major factors limiting economic development of the state is the poor development of its infrastructure. The irrigation potential created from M & M Irrigation Schemes till 1979-80 was 24.52 lakh ha while the M.I. Schemes had created a potential of 23.95 lakh ha. Though this is a substantial step-up from 1950-51, yet it remained far short of the utilisable water resources

of the state which has been estimated by the Bihar State Irrigation Commission at 80.31 lakh ha meters of surface water and 33.34 lakh ha meters of groundwater. By the end of June 1978, only 24.9 per cent of irrigation potential could be harvested as against 85 per cent in case of Punjab and 61.5 per cent in the case of West Bengal. Prior to 1950-51, irrigation facilities were concentrated in south Bihar plain. Plan development has reduced regional disparities in this regard by creating substantial potential in north Bihar in recent years."⁸

The VI Plan Irrigation (M & M) programme, in concrete terms, boiled down to this—that seven out of 12 major pre-1976-77 schemes, 1 out of 11 1976-80 major schemes and 1 out of 18 1980-85 major schemes were proposed to be completed. Further, all the 19 medium schemes of pre 1976-77 period, all the 25 of 1976-80 period, and 16 out of 43 of 1980-85 period were intended to be completed. Besides, 5 out of 8, 1980-85 modernisation schemes would also be completed. Rs. 843.36 crores, thus, out of Rs. 1015 crores would be for ongoing schemes."⁹

According to the Union Irrigation Ministry's estimate of the groundwater potential in the Bihar state the main alluvial tract forms a part of the central Ganga basin, covering almost the entire area north of Ganga and sizeable area immediately to the south. These alluvial formations are the most prolific water-bearing horizons—tubewells 250 m. deep and tapping 39-45 meters aquifer material and capable of yielding 120 to 223 cubic meter/hour of water for drawdowns ranging from 4 to 9 m. are feasible in most part of north of Ganga and at few places south of it.

What a gap between resources potential¹⁰ and its utilisation ?

Flood Control

Floods are a regular feature in the state causing huge inundation, congestion of drainage and erosion of river banks. The major rivers of north Bihar flowing down from the Himalayas have very steep slopes in the upper reaches but they gradually become flatter before joining the Ganges whose absorption capacity is limited. The major rivers of south Bihar spill over their banks during and after heavy rains in their catchment areas, due to poor outfall conditions and inadequate channel capacity. The situation is worsening every year on account of the increased encroachment of the plains, low outfall capacity of the rivers due to heavy siltation and deforestation in the catchment areas and poor drainage conditions.

Average annual loss by floods is estimated at Rs. 42 crores. Total area flooded is 43 lakh ha out of 173.5 lakh ha ground area, affecting 210 lakh people. Thus Bihar state accounts for 34.40 per cent of the flood prone area and 50.76 per cent of affected population in the whole country. The problem of Bihar, in short, is enormous and requires special attention.

A lot of effort has been made in the last 30 years to tackle this recurring menace but sufficient dent has not been made in the problem. Out of 43 lakh ha area affected, 26.32 lakh ha has been given limited protection—limited because with the catchment areas of the flooding rivers being in other states, Bihar cannot

provide sure protection unless effective and integrated measures are taken in the upper reaches. Problem thus needs to be tackled at the national level.

In the late 70s', an effort was made to study the flood problem in the Indo-Gangetic basin; the working group had submitted an action plan with an outlay of Rs. 325 crores for 5 years and 450 crores for 7 years for engineering works in Bihar. The state's Sixth Plan, in the meantime, accorded priority for continuing embankment schemes, anti erosion retired lines and protection works in towns, villages and vulnerable points. By end of the Plan the total length of embankments would be 3135 km, freeing 34.4 lakh ha of land from floods. (It is not clear whether these embankments normally survive the following year's floods).

Land Reforms

The Sixth Plan envisaged specific programmes aiming at updating land records, regulating rents, conferring security of tenure on tenants, enforcing ceiling laws, distributing surplus land among landless labour and consolidating of holdings. Regarding the latter, a pilot scheme of consolidation was started in 9 anchals in 1951. In 1980-81, the operations were going on in 175 anchals spread over an area of 96.30 Lakh. acres. An area of 4.11 lakh acres was consolidated in that year and in 1981-82 together. Upto 1980-81, consolidation had covered an area of 9.34 lakh acres only. A very slow progress indeed.

Agricultural Marketing

Marketing structure in Bihar is deficient in many ways. It had 672 urban and semi-urban wholesale markets and about 6000 government/privately owned rural markets—which worked out to 1 wholesale market and 10 rural markets for one lakh population in 1983-84. Out of 672 wholesale markets, only 117 were under regulation upto 1979-80; their jurisdiction had been extended to the remaining 555 markets also. The intermediate markets were not yet fully developed. Most of the markets lacked even the basic infrastructure necessary for efficient functioning. There was a meagre allotment of Rs. 11 crores in the Sixth Plan for marketing improvement viz., improvement of marketing yards, opening up of new ones, setting up of some more market committees, shops and godowns. A very small allocation.

There is a Bihar State Agricultural Marketing Board set up in 1972.

Cooperative Credit

Upto 1979-80, only 38 per cent of borrowers and 48 per cent of agricultural families had been brought under the cooperative field. In 1980-81, 52 per cent of these families were advanced loans, Rs. 1459 lakhs as short term, Rs. 198 lakhs as medium term and Rs. 1400 lakhs as long term loans. In the same year, cooperative marketing of agricultural produce worth Rs. 30 crores was handled and consumer goods worth Rs. 40 crores were distributed. The 1983-84 target was to cover 75 per cent of agricultural families and 65 per cent of borrowing families in the cooperative

fold—giving out Rs. 50, 5 and 40 crores as short, medium and long term loans to them in that year.

This effort has to be seen in the background of a state with 7 crores population in which more than 80 per cent depend on agriculture and allied sectors for a living. A very poor infrastructural (credit) facility for the cultivators.

Power

Bihar had only 3.3 per cent of the total installed capacity of power generation in the country. Only 25.9 per cent of its villages were electrified as compared with 37.4 per cent in all India at the outset of the Sixth Plan. This backwardness was obtaining inspite of the availability of all coal and hydro potential in the state.

Sixth plan provided Rs. 800 crores outlay for power generation, adding 725 MW capacity to the existing 849 MW.

By 1983-84, 36.9 per cent of villages (19199) had been electrified, compared with all India percentage of 47.3. Number of pumpsets energised before 1979-80 was 1,51,985. The Sixth Plan Target was 2,03,550 additionally.

The per capita consumption of power in the state was only 81.28 KWh as compared with all India average of 130.94 KWh.

Bihar has a long way to go in many essential respects if its economy is to improve.

Road Development

In 1950-51, the length of surfaced roads was 4800 Kms. By 1982-83 it was 23389 Kms. Earlier in 1977-78, one lakh population of Bihar had only 41 Kms of surfaced roads (compare 90 Kms all India) and 95 Kms of unsurfaced roads (compare 132 Kms all India). Only 20 per cent of rural villages with 1500 population and above and 10.4 per cent of total rural population had access to all weather roads. The aim of the Sixth Plan was to connect all villages with more than 1000 population, with pucca roads.

Command Area Development (C.A.D)

It was in the Fifth Five Year Plan that the resource-based programme for integrated development in the command areas was adopted for the first time. This placed emphasis on improved water utilisation, water delivery and drainage systems, land levelling and land shaping.

The Sone, Kosi and Gandak CAD agencies were established in 1973 and Kiul, Badna Chandan agency in 1975 under the Bihar Agricultural Rural Development Ordinance, covering 305 blocks in 18 districts, 15.76 lakh ha gross command and 32.02 lakhs ha culturable command area, with an allotment of Rs. 9.50 crores (1978-83).

Survey, planning and on farm development work was taken up in these agencies and contour survey, soil survey, land levelling and shaping, construction of field

channels and drains and installation of 424 state tubewells were part of the programme.

Highest priority was given to on-farm-development like field channels, land levelling and shaping and field drainage in 2 stages, viz. (i) construction of field channels in 5 to 8 ha blocks along the ridges without waiting for consolidation and realignment of holdings but based on detailed shaping and planning of each outlet command and (ii) land levelling, land shaping and construction of field drains to be undertaken following consolidation and realignment of holdings. This latter consolidation work would be done keeping in view the alignment of field channels construction during the on-farm-development programme.

Other Programmes

Programmes like SFDA, MFAL, DPAP (Drought Prone Areas Programme), IRDP (Integrated Rural Development Programme) addressed to specific target groups, with linked financial allotments, will offer a very vast field of developmental activity, all to the joy of the state development functionaries if they are interested in their task genuinely.

Bihar cf : Punjab Agriculture (A study in regional disparity)

Bihar is one of the most backward states in India and Punjab the most advanced and prosperous. The big disparity between them in per capita incomes has widened in the last two decades—from 77 to 110 per cent in the first decade and a much bigger gap in the second decade (1974-84) because—

- (i) pressure on land in Bihar is twice as much as in Punjab;
- (ii) comparable irrigation facilities have not been created in Bihar, nor have these been utilised fully where created. Bihar's agriculture is subject to vagaries of monsoons to a much greater extent;
- (iii) infrastructure facilities for industries are poor in Bihar, including supply of power at reasonable rates and availability of surface roads; only in mining there has been some progress but its benefits have accrued to other states more than to Bihar;
- (iv) "If all Bihar's rich raw material potential could not tempt enough enterprise from outside it is because of Bihar's poor infrastructural facilities, not to mention the incompetence and work of the State Government";¹¹
- (v) administratively Bihar has done poorly. Even when resources were available, these were unutilised. Lack of a proper law and order environment, a faulty sociopolitical ethos were responsible for this.

Every third holding in Punjab in 1973-74 was more than 10 acres and every fifth more than 15 acres. In Bihar, every 13th holding was more than 10 acres and every 30th more than 15 acres. Holdings being very small, in Bihar even these were scattered in many places in the village. *Consolidation of holdings was moving at a*

snail's pace. Punjab had completed these operations by the IV Plan end, whereas in Bihar only 2 per cent of its agricultural land of about 12 mha would be consolidated by the end of that Plan. This was the biggest snag in the agricultural situation of Bihar.

Similarly in the utilisation of the irrigation potential, surface as well as ground water, Bihar has lagged far behind Punjab. In fact there was more emphasis on using up the surface water potential, even though it was more time and money consuming. A good deal of ground water potential remains yet to be tapped even though it is much cheaper to do so.

Let us compare the area, production and yield of cereals in Bihar, Punjab and all India, from 1967-68 to 1981-82 :

TABLE 33
Production and Yield in Punjab and Bihar Compared
Area, Production, Yield of Cereals (Compare)

Year		Bihar	Punjab	All India	
1967-98	Area	8138	2956	98,712.6	Area= '000 ha
	Production	7343	4901	82,949.7	Production= '000 T
	Yield	102	1657	840	Yield= kg/ha
1968-68	Area	8222	3182.5	99,165.8	
	Production	7863.7	6004.2	83,594.8	
	Yield	956	1887	843	
1969-70	Area	8280	3393.9	1,10,596.7	
	Production	6437.5	6504.8	87810.6	
	Yield	777	1917	865	
1970-71	Area	8109.3	3429.0	1,10,446	
	Production	7219.6	6713.3	96235.5	
	Yield	890	1958	949	
1980-81	Area	8657	4505	1,04,210	
	Production	9078	11703	1,18,962	
	Yield	1049	2816	1142	
1981-82	Area	8488	4675.5	104948	
	Production	7811	13167	1,21,710	
	Yield	920	2548	1160	

Source :— (i) S. Hajra "Bihar and Punjab—A [Study in Regional Economic Disparity," Economic and Research Foundation New Delhi. p. 47, 1974.
(ii) Indian Agriculture in Brief 1982

In Bihar between 1967-68 and 1981-82, for cereals only area increased by 6.4 per cent, production by 23.6 per cent and yield by 16.3 per cent.

In Punjab area increased by 53.6 per cent, production by 139 per cent and yield by 69.9 per cent. *All India*, area increased by 6 per cent, production by 43.4 per cent and yield by 38 per cent.

Figures speak for themselves. Bihar has not been able to keep up even with the all-India averages, leave aside competing with Punjab's progress in production and productivity of cereals. This meant Bihar was not able to feed its own increasing population because import of grain as per cent of own production in 1969-70, was 12.80; in 1970-71, it was 14.52 per cent; and in 1980-81, 10 per cent.

Casteism and Situation of Law and Order in Bihar

There are three prominent caste divisions in Bihar (i) Upper classes (including Brahmins, Bhumihars, Rajputs and Kayasthas) (ii) Middle backward castes (including jats, yadavs, Kummis and Koiris) (iii) Untouchables and Harijans. Conflicts take place between (i) against (ii) and (iii) and between (ii) and (iii) inter se. Every action of the government, more or less, gets entangled in these conflicts. Because of lack of unity among (ii) and (iii), agrarian relationship in the state tend to remain semi-feudal in character, especially in north Bihar where absentee landlordism (upper-class) prevails and the socio-economic conditions of small land-owners, sharecroppers and agricultural labourers go on worsening. These upper caste landlords are allergic to farming with their own hands—they treat it as a profession for lower castes only. The holdings are scattered in tiny plots, sometimes even less than $\frac{1}{4}$ acre in size. The absentee landlords' holdings are also spread over a wide geographic area seldom contiguous. They sometimes are ignorant of what they have. Land ceilings are avoided by concealment and benami transfers. Land reforms are made unsuccessful by collusive transactions and corrupt practices.

Official land records are seldom complete or updated; it is difficult to get at the truth. A ceiling may be enforceable if records show a holding beyond the limit. The Land Reforms Act 1961 had a lacuna which facilitated benami transfers mostly fraudulent. The ignorant, poor and resourceless peasantry is not able to assert or establish its rights. The landlords are generally supported by the police, administration and even the courts. To gain political support they keep in alliance with armed criminals, or even create them around smuggling operations across the border in the north. Violence has been a salient feature of the rural north Bihar where illicit manufacture of and trading in arms is very common. Lately, child lifting has become common in some districts for realising a huge ransom money from the parents. They thought it was a better way than killing people and creating problems even for the police. "With political protection and a complacent police force, there are no limits to extortion and terrorism by criminal gangs in north Bihar. At election time these groups have no difficulty in persuading election officials to hand over ballot papers to them. Neither the officials nor the voters dare complain."¹²

In West Champaran district [of north Bihar,] the dacoits rule the show with

guns and call themselves "Bihar Sarkar" on their letterheads. Reportedly there are six groups of dacoits in the area, each with own jurisdiction, laws and law-enforcing machinery. They started committing crimes in 1980 and later changed over to kidnapping people for ransom. Some pressmen have even averred that "local people are convinced of a dacoit-police-politician nexus since police have been able to liquidate only two dacoits in encounters. None has been arrested so far. Those police officers who try to take action, are transferred by Government."¹³ A still worse situation is that the "dacoits are now enforcing Section 144 on some farms of the area; the owner is not allowed to work on his farm unless he pays the tax demanded by the "Bihar Sarkar". Police gives no protection to the farmer. Farms are thus being abandoned. If the trend continues, rich farmers of the area may sell their areas and move out."¹⁴

Crime has become an inextricable part of politics in Bihar. People in power maintain goondas to remain in power. The rise in the number of people entering politics with criminal background is alarming. In Bihar crime has become a political necessity—something without which any party or group finds the going difficult. The weekly 'Sunday' from Calcutta (3-9 March 1985) has summed up the position in its cover story as under :

"The birth of the criminal elements in the state's body politic has taken place in the lap of the feudal set up with its deep-rooted caste rivalries and economic backwardness. Landlords and zamindars kept their musclemen at their beck and call to terrorise poor tenants and extort money from them.

This has continued even after 1947. The same ethos prevails today. Economic advancement of backward classes has created more tensions."

Dealing with the criminals in Bihar is a serious problem. A senior police officer candidly remarked :

"Even if we want to check lawlessness in the crime-ridden vast "diara" areas of the state, we cannot do so. The problem is very complicated. In the absence of periodic land surveys, it is very difficult to fix land ownership in this area. The boundaries fixed by one claimant are washed away by floods and by sowing time in the next season there is practically no sign whatsoever left to prove ownership. In this situation might becomes right."¹⁵ People are murdered, maimed or harassed for establishing their ownership rights. The musclemen render help to people in difficulty, protected by the politicians. Said Dr. Jagan Nath Mishra, ex-chief Minister : "But what can you do when every party seeks them out during the elections. The parties must all combine to decide to eschew this practice. There can be no solution otherwise".¹⁵

Curse of Money-lending

It is said that the institution of money lending has become ingrained in the population of Bihar and the whole thinking of the people is coloured by it. The

saying goes "Those who can, lend; those who cannot, borrow" The bulk of the small and marginal farmers and more so the agricultural labourers are deficit ones, in the sense that their minimum consumption expenditure exceeds their income. This forces them to raise consumption loans at prohibitive rates of interest. The security, if at all, is in the shape of a little patch of land of the borrower—the transaction makes him a perpetual bonded labourer, ending up in the sale of his land at cheap rates. To the lender, the profession lends respectability, social stability, as well as a political base.

Bihar Government's Scheduled Castes, Scheduled Tribes, Backward Classes and Denotified Tribes Debt Relief Act 1974 and the Bihar Moneylender's Act—these two pushed usury further underground and enable the moneylenders to strike harder bargains. In the absence of an alternative source for borrowing, the peasant is compelled to borrow for mere subsistence and thus part with his asset—land, labour or livestock in the end. Poverty does extract a big price from its victims.

An extreme view has been expressed about Bihar's agriculture as under :—

"This is a state whose agriculture has been widely described as characterised by informal bondage leading to semifeudal exploitation based on usury, to practice for perfection in the art of using euphemisms to evade reality".¹⁶

The purpose behind inflicting this dull, lack-lustre narrative is to indicate that in such a murky situation it will be quite difficult, if not impossible, for the state development administration to create an environment in which modern agriculture could take root and productivity per hectare improve. Modern agriculture is not a one time affair for action so that the other things follow automatically and enhanced production takes place as soon as the infrastructure is created and inputs are made available. The confidence of the farmer gets built up only when he is sure that he will get the return on his investment and a suitable reward for his efforts in time. Apart from other favourable conditions to develop over time, it is absolutely essential—as a basic—that law and order situation is sorted out and people are able to get about their business with a carefree confidence and a long range perspective in mind. It is only thereafter that provisions relating to consolidation, prevention of fragmentation of holdings, guarantee of minimum wages to rural farm labour, regularisation of money lending activities, provision of debt relief to the peasants, procedure for writing down/updating of rural land records relating to leases and land tenures could be properly implemented.

Even this may be an over-simplification of the prevalent situation in Bihar. As it is, the available facilities are not being used on account of selfish ignorance, outmoded antidiluvian ideas and rigid attitudes of the landlords, even of some farmers. For example, presence of irrigation facilities in north Bihar has seldom been an incentive to fully develop the agricultural potential. Most landlords secure them for small suitable bits of their lands, to make only a good living—the rest of the land they cling to as a money potential and as a symbol of social status and political power. Fancy their ignorance that they resist consolidation in the fear that they may become vulnerable to ceilings legislation! Similarly, the small holders and

sharecroppers do not avail of the flood protection embankments created by the Irrigation department for lack of capital or credit to buy inputs for intensive modern farming. Even then the small farmers are producing more foodgrains per hectare than the large farmers. The potential, however, still remains to be exploited, particularly of irrigation; if that is done many other things could follow. But many of the connected actions have to precede that exploitation.

How the old habits/practices get the better of the obtaining law, much to the detriment of the underdog, may be seen from the quotation below :

"Sharecroppers are by law to give only 25 per cent share to the landlord; actually they give 50 per cent, the landlord providing the entire cost of cultivation. The landlords generally prefer to get them recorded as agricultural labourers.

"In practice most landlords are delighted to maintain traditional sharecropping arrangements with their cultivators so long as the latter are willing to call themselves agricultural labourers and do not insist on the security of tenure or share of produce under the law. The cultivator can insist on his rights only by severing ageold connection with his land-owner patron."¹⁷

It is such a vicious circle prevailing in Bihar—between the landlord in his outmoded, ignorant and obscurantist ideas of self grandeur and selfish behaviour—and the clumsy dependence, ignorant helplessness and utterly penurious hand to mouth existence of the marginal farmers and agricultural labourers, so much so that they cannot even assert their rights etc.—"that it will take some time before any enlightened state government at the political level, and its well meaning, honest and devoted bureaucracy, can break that circle. Time may be available, perhaps, but the latter two intermediaries may be difficult to come by in Bihar to deliver the goods."¹⁸

That Bihar is indeed very backward agriculturally, industrially and generally, there is no doubt. The preceding account has dealt with the sorry state of its agriculture, including poor infrastructure in irrigation, flood control, consolidation of holdings and power. It has drawn attention to a few indicators of its backwardness in which Bihar is almost at the bottom of the rung among the big states—'almost' because Madhya Pradesh steals the downward show in some respects; both are far below the all India average. Two statements elsewhere in the book (see chapter 9)—one comparing the per capita income estimate of various states with the country's and the second indicating some important interstate disparities—show clearly that in regard to the per capita incomes at current prices, Bihar stood 15th in the list—that is the lowest—in 1960-61 and it remained in the same position even in 1981-82. It not only did not improve its overall/relative position but it slid down much lower in the gap between its income and the all India average (cf : 215/306 and 995/1750 in rupees). In regard to per capita power consumption and surfaced roads, for 100 sqkm, it was far below the all India average again—though UP was also in the same boat. Even in the productivity of cereals Bihar has not been able to keep up with all the India average. And so on.

The state planners are conscious of this rearmost position of the state; they find alibis, some plausible some untenable—some others utterly meaningless. They very politely observed as under in their Draft Sixth Five Year Plan :—

“Three decades of planned development in Bihar have brought about some changes in the situation in so far as gross state product is going up consistently, albeit at a slow pace; output in principal sectors like agriculture has increased significantly; also to some extent infrastructural facilities have been strengthened. Nevertheless, the state economy continues to be characterised by adverse demographic factors, imbalanced economic structure, poor infrastructure development and low level of consumption.”

They have blamed the Centre for low financial assistance/investments in the five yearly planned programmes for the state, admitting that with a low income base the state could not mobilise its own resources. The planned investments have been below all India average no doubt.

The state of Bihar has always been a feudal, backward, almost hopeless state, plagued by violence, criminality and gangsterism difficult to manage. Its politics has been tortuous, devious, reeking of corruption, far below the all-India averages in all respects. No wonder developmental efforts have not yielded results; even the standards available at independence were drawn down by the mounting demographic pressures. By all accounts a badly managed state; its great majority of people are marginal farmers and landless labourers, all in the thrall of landlords and their caste allies who have the support of the local police on their side. Tension would naturally grow when the poor would demand their rights.

Trevor Fishlok, a foreign observer, wrote in his book “India File—Inside the Subcontinent” that in 1980 when Dr. Mishra became the State’s Chief Minister for the second time, “this man and this state came to ‘represent the rhinocification of India’ and his regime was characterised by cynicism, dishonesty and ‘inefficiency’.”¹⁹ One need not elaborate further.

Dr. Hanumantha Rao believes that “there is an element of ‘inevitability’ with regard to the increase in regional disparities in income in initial phases of modernisation though there would be considerable scope for reducing, if not eliminating altogether, these disparities in course of time through public policy.”²⁰ He observes that the prevailing regional differences (say between Punjab and Bihar) in factor endowments, physical, institutional infrastructure and entrepreneurship are usually the outcome of the complex process of socio-economic development, over a very long period; these disparities cannot, therefore, be corrected in the short-run despite some interregional migration of labour and capital.” It seems he came to this conclusion because of the inherent gap between the ethos of an old “zamindari state”, compared with a ryotwari type, the former not being conducive to speedy growth because of the dominance of the parasitic upper caste landlordism etc.

This theory of ‘inevitability’ and the long duration of the catching up process must be questioned; the length of the remedying time can be very much shortened by a determined political will of the state government and its implementing machinery.

Kairon and Bansilal have shown the way a couple of decades back in the Punjab-Haryana belt. Haryana region of East Punjab was relatively backward in every respect agriculturally, industrially and educationally. Under a determined and resourceful Bansilal, it made tremendous strides in the developmental field in a short period and became number two state in the country in many aspects, including productivity of foodgrains. There may not be any scope for an "instant" development of Bihar but the Punjab-Haryana pattern could be a good guide, to get the pace of development going, provided the political will were there and the instruments of implementation—the inevitable bureaucracy—were properly trained, motivated, sharpened, and utilised for a joint venture and an honest exercise in giving shape to a plan of action arising from determined imagination.

For example why can't consolidation of scattered holdings be taken up in right earnest?

Why can't utilisation of irrigation facilities, already available, be improved upon and then expansion concentrated mainly on the cheap exploitation of ground water which is so amply available in the state?

Why can't the plant load factor of the states power generation plants be stepped up from the present about 40 per cent atleast to the all India average of 55 per cent?

Why can't the present anemic land reforms programme in the state be made more realistic, assertive and effective? The most important part of it, viz. the locating of surplus land under the ceiling laws and distribution thereof among the landless etc. could be implemented with vigour and determination. The present pattern of land ownership and agricultural operations in Bihar is highly skewed; public policy must ensure that the share of the small and marginal farmers in land ownership/operation, and consequently in the growth of production, is substantially raised.

"This can be done partly through land redistribution but, perhaps, largely through concentration of all public (and private) efforts to improve the production and productivity on small farms, through application of improved technology, extension services, adequate credit, input supply and correlated infrastructure."²¹ This will widen the base of production if the small and marginal farmers are assisted to increase their share in production.

The importance of agricultural development in Bihar state's economy may be summed up in the following quotation from an article which appeared in the Times of India, in March 1981 :

"Bihar is essentially rural in character. 90 per cent state's population lives in rural areas; even most of its towns have the characteristics of overgrown villages.

It is not generally realised that in a situation such as ours industrialisation of a level which would make a dent on poverty and mass unemployment can come only after we have achieved agricultural prosperity. There has to be rapid growth in agriculture so that output levels do not fluctuate too much from year to year. Then the demand for mass consumption goods will be greatly increased. Availability of resources, infrastructural facilities and other promotional measures by the state may provide the necessary condition for

industrialisation but the sufficient condition for rapid, sustained and healthy industrialisation is the creation of massive domestic demand for basic wage goods. The absence of food and agricultural raw materials surplus is also an important barrier to rapid industrial growth".²¹

Suggestions

(i) Law and order situation in the state must be sorted out on priority. No meaningful development will be possible unless there is peace in the countryside and the population feels secure in the belief that their rights are safe and enforceable and the aggrieved can turn to the officials for quick redress and the courts are open.

(ii) The administration must be improved so that it can deliver the goods on the basis of clear socio-economic objectives, broadly shared by the political rulers and the bureaucratic machinery.

(iii) In the economic/agricultural sphere priority must go to

- (a) consolidation of fragmented holdings;
- (b) irrigation potential augmentation, especially in the minor irrigation (ground water exploitation) sphere and its utilisation which is vital;
- (c) flood protection in Bihar must be dealt with at the national level;
- (d) credit, power and road development need special attention in the state; present dispensation is very poor infrastructurally;
- (e) marketing infrastructure needs improvement ; see example of Punjab and Haryana;
- (f) small and marginal farmers must receive preferential attention. Bihar's future production and productivity will depend on their efforts;
- (g) planning in the state hitherto has demanded more or less equal attention to all heads of development. Resources being limited, Bihar should attend to more important and vital aspects of development in preference to all and sundry ones;
- (h) last and not least, the state is too big and unwieldy. The administrative spread is inadequate. Suitable steps are required in this direction.

It will be a long long way before Green Revolution can make a real dent on the economic conditions of the country specially in Bihar. There are too many things which need to be done before the Green Revolution can take root in the soil there-things which will create a helpful environment for its germination. A determined effort is required to be made at the political and bureaucratic levels.

NOTES

1. These statistics are taken from Bihar's Sixth Five Year Plan Draft and Draft Annual Plan, 1984-85.

2. Draft Annual Plan of Bihar, 1983-84.
3. Sixth Five Year Plan of Bihar, 1980-85, p. v.
4. Bihar's Draft Sixth Plan, *Ibid.*, p. vii.
5. Bihar's "Economics of Poverty in Plenty"—by R.K. Sinha, *Economic Times*, dated 1.1.85.
6. Bihar's Draft Sixth Plan, *Ibid.*, p. iii.
7. Bihar's Draft Sixth Plan, *Ibid.*, p. 7.
8. Bihar's Draft Sixth Plan, *Ibid.*, p. iii.
9. Bihar's Draft Sixth Plan, *Ibid.*, p. 75.
10. "Ground Water Resources and Development Potential in India", CGWB, Ministry of Irrigation, Govt. of India, December, 1981.
11. *Financial Express*, New Delhi, 7.1.81.
12. Ajit Bhattacharya : "The Boil that Burst"—*Indian Express*, 17.9.77.
13. and 14. Bihar's "Other Sarkar" by Jubaraj Ghimire Bettiah "Sunday" Calcutta—27 Jan.-Feb. 1985.
15. Janak Singh : "Lawlessness overtakes Bihar" *Times of India*, New Delhi, 14.5.85.
16. Arvind Narayan Das "Does Bihar show the Way"? Research India Publications, Calcutta, 1979, p. 29.
17. and 18. Marcus Franda—"Small is Politics"—Wiley Eastern Ltd. (Chapter 7—Caste and Class in Bihar), New Delhi, 1979, p. 246.
19. Trevor Fishlok, "India File—Inside the Subcontinent"—John Murray, London, 1983, p. iii.
20. Dr. Hanumantha Rao—"Technical Change and Distribution of Gains in Indian Agriculture", Macmillan, 1975-80, pp. 92-93.
21. M.L. Dantwala's Article "Agricultural Prices, Production and Surplus Stock" Unpublished—prepared for a seminar in Delhi held in April, 1985.

PART FOUR

Some Ideas and Some Suggestions

Green Revolution—How, Why and Why Not ? An Analysis

We have so far dealt with the essentials of the Green Revolution and seen how the states of Punjab, Haryana, UP and Bihar were affected by it and reacted to it—one way or the other—in the last about two decades. In that process we have seen how these states handled their problems of agricultural development in the period preceding and following the revolutionary introduction of dwarf wheat seed varieties on the Indian scene. In brief, Punjab made the best of the Green Revolution technology from 1965-66 onwards, mainly because the ground had been prepared for it earlier—not by design as such but in the ordinary course of successfully augmenting agricultural production in the traditional manner—and Punjab had built up a sound infrastructure in the process to an extent that when the miracle seeds arrived, these were received with open arms by its farmers who happily fulfilled Borlaug's dream that the production of wheat could be doubled in ten years—(1962—72). Haryana, initially suffering from a grievance that in the composite state of Punjab the interests of the Hindi region had been neglected, started its separate existence in November 1966 just when the Green Revolution was ushered into northern India and did not take long—just about six years—to catch up with the basics of science and technology push in agriculture and showed results in foodgrains production with a speed rarely experienced before anywhere in the country.

Punjab and Haryana were two small states—both not more than 2 crores of people together before they were separated towards the end of 1966. UP, with more than four times their population and with as many as 56 districts, tried its best to follow the path of the Green Revolution but succeeded only in its western region, firstly because of some natural advantages but mainly because of its contiguity with Haryana State and the fact that with the partition of the country in 1947, some elements of non-muslim population from Pakistan side of the Punjab had come to settle down in the western districts of UP and had introduced their outlook, habits of

hard work and efficiency in the new areas of their domicile. As we go east from the western region of UP, down the Ganges, we still find only traditional modes of agriculture, by and large, as if the new technology of Green Revolution was something of not much concern to the residents of eastern UP and Bihar. Our examination in the earlier chapters has revealed that in the matter of food production not much solid work had been done in keeping with their natural potential, or better still, nothing useful had happened so far in the real forward direction in these areas. Taking into account the mounting population of these two states the per capita incomes, productivity and the general standards of living of their people have, if anything, deteriorated, even beyond where these stood in 1947. Disappointing, indeed.

Tables 34, 35 and 36 are added below showing (i) yield of principal cereal crops (Table 34), (ii) per capita income estimates of 15 important states of India, at current prices from 1960-61 to 1981-82 (Table 35) and (iii) some indices of interstate disparities in some spheres, in regard to the same states (Table 36)—in all cases comparing them with all—India averages. It will be noticed that Bihar state is at the bottom rung in all respects and the UP is only a shade better—but both are below the all India averages generally in all respects. Their backwardness in the agricultural sphere is borne out by their per hectare yield of cereals (Table 34).

Punjab stands at the top in this regard, followed by Haryana as No. 2—both far above the all India averages. UP just touches the all India average yield in wheat but in rice it is far behind. Both in wheat and rice, Bihar is at the bottom of the list, except for Madhya Pradesh.

One can go on multiplying these inter-state comparisons of growth in various spheres but the net result is not going to improve. Bihar and UP both come out lagging behind, especially in the matter of foodgrains production and productivity with which we are here concerned. It will be worth while to go into the matter at

TABLE 34
Yield of Principal Cereal Crops, 1980-81 and 1981-82 (Some States Compared)
(In kg/ha)

State	Rice		Wheat		Cereals		Foodgrains	
	1981-82	1980-81	1981-82	1980-81	1981-82	1980-81	1981-82	1980-81
AP	2068	1947	—	—	1403	1310	1238	1141
Bihar	781	1015	1473	1314	920	1049	872	989
Haryana	2470	2602	2357	2359	1761	1743	1391	1519
MP	793	834	994	934	793	787	719	697
Punjab	2957	2736	2932	2730	2816	2598	2667	2458
TN	2261	1865	—	—	1744	1493	1520	1335
UP	1078	1053	1641	1650	1275	1273	1191	1219
All India	1317	1336	1696	1630	1160	1142	1033	1023

Source :— Indian Agriculture in Brief, 19th Edition 1982. pp. 256-257.

TABLE 35
 Peacapita Income Estimates of Various States and All India
 (at Current Prices)

	State	1960-61	1965-66	1968-69	1970-71	1973-74	1977-78	1981-82
	1	2	3	4	5	6	7	8
1	AP	275	387	495	584**	829**	1002	1536
2	Assam	315	399	514	538	644	932*	N.A.
3	Bihar	215	332	376	402	575	735	995
4	Gujarat	362	498	605	829*	1121*	1452*	2211
5	Haryana	327	450	635	845*	1174	1600	2574
6	Kerala	259	380	496	584	800	987	1312
7	MP	460	305	430	489*	725*	950*	1217
8	Maharashtra	409	534	700	809*	1125*	1637*	2519
9	Karnatak	296	448	588	685	973	1120**	1458
10	Orissa	216	329	464	482	697	799*	1147
11	Punjab	366	562	903	1030	1438	1991*	3122
12	Rajasthan	284	373	414	623*	824*	964*	1417
13	TN	334	403	499	595	830	1036	1373
14	UP	252	373	453	486	673	916*	1309
15	WB	390	532	660	735*	946*	1268	1595
16	India	306	426	552	633	871	1189	1750
	Rank of UP	14	12	13	14	13	13	12
	Rank of Bihar	15	13	15	15	15	15	12

Source : (i) Statewise, Estimates of State Domestic Products. Natural Account Statistics, Govt. of India 1976, 1980.

(ii) Draft Annual Plan of UP 1984-85 vol. I p. 15.

(iii) P 56-See Annexure II UP Draft Sixth Five Year Plan 1980-81 (Review) vol. I Nov. 1980.

* Quick estimates.

** Provisional Estimates.

TABLE 36
Some Indices of Interstate Disparities

State	% Share of population	Percapita Income 1973-76 (Av) in Rs.	Percapita Plan outlay 1951-79 in Rs.	Percapita Central Assistance 1951-79 in Rs.	Percapita market borrowing 1970-79 in Rs.	Central Undertakings Invest- ment upto 31.3.77 Interse %	Percapita Consumption of Electricity Kwh	Length of surfaced roads per 100 Sq/Km of area in Kms as on 31.3.75
1	2	3	4	5	6	7	8	9
Punjab	2.63	1,576	1659	497	73.11	2.2	242	30
Haryana	1.95	1399	1671	529	107.83	1.6	174	34
Maha- rashtra	9.80	1,349	997	211	62.68	7.1	199	16
Gujarat	5.19	1,134	1032	261	81.66	6.0	192	19
Karnatak	5.70	1045	768	293	67.43	3.0	148	30
W.B.	8.61	1033	586	246	77.97	8.6	125	33
Kerala	4.15	948	709	347	79.86	3.1	93	50
T.N.	8.01	942	660	250	66.70	5.2	146	46
A.P.	8.46	928	669	283	42.67	4.4	77	19
Rajasthan	5.01	853	695	373	74.45	2.5	83	7
Orissa	4.27	793	696	385	50.03	7.3	112	9
M.P.	8.10	776	667	286	39.78	16.7	90	9
U.P.	17.17	715	636	251	35.17	4.2	86	11
Bihar	10.95	545	479	250	34.50	8.1	82	12
All India	100	930	734	279	55.35	100.0	121	17

Source: P 37, Annexure III, Draft 6th five year Plan 1980-85 U.P: Review Vol. 1.

length, to find out what has been basically ailing these two important states or what are the factors responsible for disabling them from acting effectively in this regard. We can study the subject under the following broad categories of constraints in the coming chapters though not strictly in that sequence :-

- (i) Reasons of size, space, area and local resources at the macro level, reckoning any special advantages available to the states of Punjab and Haryana.
- (ii) The extent of administrative involvement in intensive agriculture at the field level which showed beneficial results in some states, not in others.
- (iii) A scrutiny into the common phenomenon in India of a yawning gap between promise and performance, between planning and implementation. Was Gunnar Myrdal right in calling India a soft state administratively?
- (iv) Some human factors relatable to leadership, discipline and work ethos etc.

A recent study¹ of the problem of stagnant agricultural production in eastern India (Eastern UP, Bihar, Orissa and West Bengal) concluded that even though the bulk of this region was blessed with good soil, water and labour resources and historically its productivity in this field was the highest in the country, its pre-eminence got eroded in recent times for institutional, technological, economic and other reasons. When the Green Revolution technology came on the scene in the country in the mid sixties, it worked better in northern and southern regions because the conditions there were more favourable. Government did not create the necessary infrastructure in the eastern region nor did it bring the needed inputs within easy reach of the cultivators partly because of deficiencies of administration and management in the region. This neglect resulted in accentuation of the problem of unemployment and poverty in these states.

This study, however, expressed the view that some recent development measures taken by the Government had helped in reducing a few of the many constraints plaguing the region, and, in result, its agriculture was near, although not quite, on the threshold of accelerated progress requiring a big push in terms of investment, management and policy to get over more serious constraints blocking the way."

The study Report spelt out a number of programmes to be undertaken in a planned and coordinated manner. Some of these are included in chapter 15. The spearheads of these programmes had to be in terms of massive provision of tubewells, pumps, drainage, micro water-shed development, power, inputs, custom services, investment and credit etc. Once these made an initial breakthrough, other suggested measures would become more effective and the resulting technological surge would help to weaken some of the institutional and structural barriers which had proved intractable so far. The Report expressed the hope that conditions, thus, would be created for converting the eastern region into a granary that it was, but the effort required would be massive, with the government playing a key role in it. This study proposed an efficient and well coordinated management and simplified procedures as a precondition for a rapid and extensive adoption of modern technology by farmers of the region. Finally it expressed the view that the big investments suggested for

the programmes in the Seventh and Eighth Five Year plans would be well justified in the shape of net returns from the programmes if these were to be properly implemented.

This was all well put and smoothly said. But there are many a "slip between the cup and the lip" in our present administrative system and the peculiarly difficult "environmental" situations in which the states of UP and Bihar are currently placed. The major question remains : how to put all these good ideas and technologies, so well researched and time tested in practice, on the ground in their soils? Merely providing for them materially and financially will not do. Merely putting them across in the shape of five yearly annual plans will not do. *Something else has to click all along and down the line in these areas before action starts in unison, coordination full steam, aggressively and fruitfully on the ground.* What follows in the rest of the chapters is an account of the possible ways showing how that situation can be improved—only improved—learning from the experience of Punjab and Haryana states over the last two to three decades. The minimum steps required for improving the present constraint of the yawning gap between promise and performance of the administrative machine on the one hand and by now the inevitable distance between the plan and its implementation, will become clear as the narrative develops. Virtually the overall objective aimed at would be to put the administrative machine in a proper working order which, if it is properly inspired, organised, disciplined, controlled and monitored, should be able to deliver the goods for which huge investments would need to be made. In a developing economy things cannot be left to private bodies and institutions in the hope that growth will take place automatically. Governments have to step into the fray directly with plans, investments, input supplies, education, research and extension as well as irrigation supplies, fertiliser distribution, hyv seed production, road building, power generation and distribution—in fact the whole gamut of supplies and services which go into the augmentation of agricultural production and productivity in a region the size of which is much bigger than many countries of the world. One must be prepared for many lapses, inefficiencies and wastefulnesses in the process but the effort would be to get the maximum result from the investments made. Proper planning and a well-coordinated implementation of that plan would be successful on the ground only if there is a well led team of workers of concerned disciplines in the field a team which is not only properly motivated, even inspired by the political or bureaucratic bosses but also is put in charge of a small compact area, with duties well defined and the scope of work properly thought out. Such a plan, the implementation of which could be properly coordinated, controlled and monitored must, for practical considerations, cover only a manageable area of the state or its regions. The bigger the area, the thinner is the spread of developmental administrative activity on its people. Problems arise with men and the land makes its contribution to those problems to the extent it affects men directly or indirectly. It is to help solve these problems that men have to be guided, prompted, cajoled and even pressured into taking some positive steps in their own social and economic interest, for which all facilities would be provided in the shape of supplies and services by an enlightened, well meaning government. The bigger the area to be covered by one team of workers, the more diffused will be the spread and effect of its efforts. What

should be the size of such a unit of planning and its management, becomes a crucial question. Punjab and Haryana experience, inter alia, will have to help in prescribing the guidelines. States with 12 or even 7 crores of population are, at any rate, too big to be developed economically in a short-time.

Let us now deal with the problem more specifically.

There is no doubt that Punjab right from 1947 had the initial advantage of being a small, manageable state in which people's problems connected with the resettlement of refugees, augmentation of agricultural production, industrial advancement, growth of education and people's welfare could be properly attended to by the administration, at political as well as bureaucratic levels with ease, promptness and in right earnest and workable solutions found to those problems. The political head of the state, the Chief Minister, then generally blessed with the political stability of his regime, knew his team of workers well, both at the political and the administrative levels, and could tackle the problems satisfactorily as they arose and with the requisite deliberation and circumspection. This top boss generally had the real feel of the situation; he could supervise and monitor, even personally, some of the developmental operations he had set in motion, with a depth of attention and apply correctives where and when necessary. In this respect the state was exceptionally lucky in having the late Partap Singh Kairon on the political scene for a little less than 18 years, first as Development Minister and then as Chief Minister (1956-65), fully in control of the situation, with a rare intelligence, imaginative foresight and capacity for hard work, endowed with an iron will, a sense of humour and the knack to make others work effectively. He had the love of the state dear to his heart; he wanted it to grow politically, industrially and economically and to that end he was determined to do his best in every way. With example, persuasion, threats and cajolery he was able to create an environment of genuine activity and progress all around, in which tangible results followed the earnest efforts on the ground as well as in offices. In short, all concerned were putting their best foot forward, some in the fear that their progress or lack of it was being watched and others in the hope that their earnest efforts would be amply rewarded. The 'whip and the carrot' were rarely used so well together, to produce top results in a remarkably short span of time.

As the chapter on Punjab shows there was a remarkable progress in the state in the field of agricultural production, not only in total production of cereals but also in productivity per hectare; all this success had placed it on top of the country and made this small state an envy of others, really an example to emulate. This performance came to international notice as well, particularly the success in the yields per hectare of wheat reached by Ludhiana district—later in rice also. The secret of this success, next to inspiration from the top, was that the state government took quick decisions and timely action when any gap or laches came to its notices, making sure that the pace of implementation of the programmes in the field did not suffer at the the same time. Since its overall objectives were clearly defined, one essential step after another came to be taken in proper sequence; when the broad strategy was abundantly clear, the inputs were arranged for supply to the farmers in the right place and at the right time. Decisions on problems were distinctly taken

by the cabinet after due deliberations and within practical limits of resources but with a flair and imagination which would tend to bring the overall objective nearer attainment. Decisions relating to consolidation of holdings, augmentation of irrigation, first surface then ground water, rural electrification, flat rates for power consumption by tubewells, village link roads to help transport and marketing of produce and so on, fall in this category of decisions which were not taken on the spur of the moment, nor lackadaisically in a huff, but after proper consideration to fit in with the overall scheme of economic advancement, the progress of which itself was an open book. In fact, if one had the time and the patience to spare, it would be a useful study to go into the cabinet notes/minutes and the departmental files, to mark precisely the dates and the nature of decisions taken by the state government—decisions which tended to put the train of progress on its proper rails at the correct time, to obviate any possibility of drift, waste or procrastination.

Even though India's is a mixed economy, in the background of a socialist democratic society in the making, government actions still have an overwhelming primacy and influence on economic activity both in urban and rural areas. In the broad framework of economic development starting from a lowly base, the position remains that people move forward generally within the parametres prescribed by the government and the economy does, over time, take a turn in the direction desired by it. In fact, the government provides the main spur to economic activity as it allocates financial resources and material inputs for various departmental programmes, directly or indirectly, besides providing the technological and administrative expertise in the earlier stages. That being the pattern generally, it is not difficult to visualise how remarkable progress can be made in the desired direction if the political leadership at correct levels, confident of its own stability and supported by an experienced and confident bureaucracy, wishes it that way and is vigilant enough to take vital decisions boldly in suitable measure and at the correct time. Being in such an effective position potentially it becomes the responsibility of the chief minister not only to carry the political colleagues with him but also to inspire the administrative machine adequately, to enable it to deliver the goods in the field. Even at the cost of repetition, a few words are quoted below about the morale of the bureaucracy, as recorded by the author elsewhere a few years back :

“Of equal, if not greater, importance is the question of morale of the official administrative machine itself—the inevitable bureaucracy—which has lately been on the decline for reasons one need not go into here. This is an aspect of a serious crisis in our current socio-political life, as well as a decline in our individual and national character. The gross and persistent misunderstandings between the political ministers and top echelons of the services during the last about a decade or two have tended to create an atmosphere in which the forms of action are considered more important than their reality and where more time is spent in appearing correct than in improvising solutions and producing results on the grounds. As a matter of fact and of real importance, the experience shows that very little progress is possible in any sphere of governmental activity involving the people unless there is a com-

plete understanding, based on mutual respect and confidence, between the political and administrative wings of the government machinery. The mutual goodwill for the common crucial task of agricultural cum economic development at all levels— particularly between the ministers and the services—is a must if the overall objectives are to be achieved in a speedy manner and the results are to be commensurate with the funds expended. It has to be remembered that between the political will of the government and the needs of the farmers in the field, the vital link is provided by the administrative cadres, the political intermediaries being only peripheral and advisory in the context of the present day realities".²

As said already, Punjab was fortunate in having the late Partap Singh Kairon as the chief minister long enough to leave an indelible mark of his capabilities on the state—a chief minister who had clearly visualised the type of a viable border state he wanted, economically flourishing, contented, forward looking, upcoming agriculturally and industrially. He decided not to leave any stone unturned for the attainment of this objective, come what may, by hook and if necessary by crook. And in a way he did achieve his aim but in the process, human nature being what it is, left a little bad taste in the mouth in the shape of the Das Commission enquiry in the mid 60's which did not establish much against him but indirectly showed that the chief minister was somewhat tolerant of unscrupulous friends and relatives and did not suffer from any unnerving confusion of ends and means in the pursuit of his goals etc. Though it was not the function of the Commission to establish what good turn the policies and deeds of this chief minister had done to the state, and what salutary direction he had given to the state's economy, it was abundantly clear that his foresight and endless pursuit of the goals had led the Punjab state to reach the pinnacle of agricultural production in the post 1947 period and made the state capable of deriving optimum advantage from the Green Revolution, thus becoming the real bread basket of India.

All the same, it will be pertinent to state here that this type of personalised but effective administration would be possible to have only if the state happens to be of a manageable size, as Punjab and Haryana happened to be.

Haryana followed in the footsteps of Punjab as soon as it came to have an independent existence as a full-fledged state of the Indian Union. Enough has been said already about her efforts at shortening the time span of Punjab's experience and attain similar goals to an extent only next to the parent state and become number two in the field of agricultural productivity in the country. Here again the credit must go to the foresight, efforts and the unstinted devotion of its chief minister Bansi Lal (1968-75), to attain the goal of a quick economic uplift of the new state. He succeeded in abundant measure to show that even against ostensibly insurmountable difficulties and odds of finance, resources and backwardness, the gaps in foodgrains production and productivity could be made up in a short-time if the political will was available at the top, to inspire, cajole and persuade—if necessary pressurize—the concerned wings of the bureaucracy to go to the farmers and convince them, with example and reason, of the advantages of adopting the new technology in agriculture,

A contemporary write-up on the progress of Haryana state has the following to say :

"In five years even though a small state, it made an all-round advance—a virtual social revolution—giving a peep into the making of supercharged minds dedicated to a particular cause—Rather dry in rain, its people hell bent on deriving the maximum benefit from their meagre resources—they are stoics, disillusioned men and women content to make the best use of what little they possess. Already in the southern districts they equate Bansilal, the miracle working CM who brought water to their villages and fields, with spirit-raising holymen given to alleviate misery—the state government is bending over backwards to introduce development projects likely to pull the long suffering villager out of his traditional backwardness. The results achieved in seven years are astounding in their magnitude. The state today enjoys the second highest per capita income in India."³

A small state—only 44,000 sq. kms, with a small population, now about one crore—one of the smallest; this fact helped rather than retarded progress. The comparative smallness of resources was more than offset by the intensive personal supervision "the men on the bridge" were able to bring to bear on the execution of development projects.

The same author continues about the Haryana leadership and experiment :—

"Was Bansi Lal a saviour or a heartless tyrant?—Bansilal calculated that political stability in the state comes about only as a result of rapid economic growth. Without letting any grass grow under his feet he cut the bureaucratic red tape to smithereens and embarked upon ambitious projects of giving people what they needed most—water, electricity, roads transport, agricultural inputs—Ever since he came to power in 1968, the wheels of Green Revolution have turned faster and faster. Not even the vagaries of nature and the selfishness of man could slow down the speed of their onward thrust—His bulldog tenacity in the pursuit of his objectives is a characteristic that brings him in line with such pragmatic administrators as Sardar Patel and Rafi Ahmed Kidwai".⁴

The ends would appear to justify the means if the ends are successful. Both Partap Singh Kairon and Bansilal had the courage, fearlessness and the gift of steady-fast pursuit of purposes they held so dear and bring them to a successful end.

Was Bansilal a saviour or a tyrant? Was Partap Singh Kairon a benefactor of Punjab or a self-seeking 'trickster'? There can be many explanations and many philosophical dissertations possible in answer to these pertinent queries and yet the answer may not be all that truthful or even correct. In our current work-a-day world, full of socio-political tensions, full of emphasis on quick economic advancement, a leader with a forceful personality gets a chance of his life time to make a mark on it to the best of his lights, ability and awareness; if he gets involved in the controversy of ends justifying the means or vice versa all the time, he may end up his political

career as a big zero. But if he is a 'go-getter', sure of his destiny, with a result-oriented bias by nature and design, clear about the paths leading to a successful end of his efforts, he does somehow try to leave behind his footprints on the sands of time and space. These two remarkable chief ministers tried to do precisely that and brought their respective states on top of the Green Revolution ladder in as best a manner as the circumstances permitted them. In the process, they came many a cropper but they got over the hurdles, not losing sight of their long range objectives and eventually succeeded. In the overall bargain they earned a bad name of sorts, unsavoury sobriquets like 'a tyrant', 'a self seeker', a 'crook', even an 'unscrupulous politician'. To how many people is given the privilege of achieving positive results for the good of society, with the use of good means only and without earning a bad name in the bargain. The peers of Mahatma Gandhi are rare to come by.

If the chief minister of a state is strongminded and clearheaded about the objectives he wants to achieve and has the capability of pulling along with his colleagues as a leader, at the same time inspiring the bureaucratic machine, he can get away with the use of pressures at the right place and at the right time, with a view to bringing the socio-economic goals nearer. Such pressures—even the use of discrete force against recalcitrant elements—need not be looked down upon but accepted as an indispensable instrument of state craft in some difficult situations. In the implementation of land reforms, for example, some 'pressures' may have to be applied to get the vested interests either cooperating or out of the way, in pursuit of the "land for the tiller" policy objective. Douglass Ensminger, once consultant to the Ford Foundation on Rural Development and its representative in India for many years in the sixties, had observed as under :—

"Following World War II only 3 countries went all the way in creating conditions for small farmers to change their values from producing to survive to producing to improve family living, viz. Japan, S. Korea and Taiwan. In all these cases, land reform programme provided incentives for those who tilled the soil to increase production for family gain. They made land and water more equitably available to all who tilled the soil. They oriented their agriculture policies to small farmers. This facilitated the transition from traditional to modernised agriculture. It be noted that revolutionary land reform programmes were implemented in Japan and S. Korea under military rule and the Taiwan under semi-dictatorial powers.

"Other newly independent nations however remained dominated by elite power structure, lacking the political muscle and the will to pass or implement land reform legislation favourable to the small farmer. US PL 480 facilities greatly reduced pressure on the political leaders for reforms or policies to modernise small farm agriculture. The Indian case was not that hopeless. It passed legislation in favour of land reforms but the implementation was colourless. Some gains were made; for example, zamindari was abolished, land tenure was secured to a considerable extent, small holdings were consolidated and land ceilings were prescribed, though not so rigidly enforced and so on."

Let us sum up here and say that the success of Punjab and Haryana in the sphere of Green Revolution etc. in the general sense has been due not only to the small size and the relatively favourable resources of these states but also to the fact that both were fortunate in having bold, energetic and imaginative chief ministers to guide their destinies at the crucial times. They performed remarkably well and made sure that the goods were delivered in time and in ample measure. Should one hazard the statement that the UP and Bihar states were not so lucky in having for long the top leadership of a calibre which could properly exploit their local resources with which the two states were endowed in no small measure? Experience of Punjab and Haryana shows that such a statement is not wide off the mark. These states of UP and Bihar have suffered for lack of adequate top level guidance and pursuit which, if available, could change the tenor of their economic life (Late Govind Ballabh Pant was on top of the political scene in UP but only for a few years after 1947). If the bureaucracy/administrative machine did not come up to the needs of the task, the responsibility for that also must ultimately fall on the poor political leadership. What, after all, is administration in a Democracy, except an instrument in the hands of the political leaders elected by the people? An individual official may have a conscience and a duty to fulfil, but the administrative machine as a whole is naturally to be at the beck and call of the chief minister. Other things being equal or similar, an inadequacy of performance in UP and Bihar states can mainly be ascribed to the inadequacy of political leadership which failed to inspire that machine in rising to the occasion nor could it awaken the farmer towards the pursuit of enlightened "self-interest" that was his due in a socialistic democratic set up. In the instant case one cannot even say that the political leadership got inextricably involved in a conflict between ends and means in which means were beyond reproach and the ends were lost in the long run. An adequate effort was simply not there; political and administrative energies seem to have been squandered in some ineffective pursuits.

The present situation in the socio-political sphere, perhaps, requires in a chief minister—or in all political leadership at crucial levels—a certain brashness, coupled with dynamism which is willing to sacrifice principles, once accepted as sacred in its desire to "go ahead" with the job of economic advancement, sometimes going crashing as a steam roller to gain his objective.

We will deal with the size of the state in the next chapter to show that smaller reasonable sized states fare better in developmental matters than the too big and unwieldy ones.

NOTES

1. Report of the "Committee on Agricultural Productivity in Eastern India", 1984 (published by RBI in 1985 called S.R. Sen Report).
2. Author's "Evolution of Food Policy in India"...Macmillan (India), New Delhi 1981; Pages 265-66.
3. Muni Lal—"Haryana, High Road to Prosperity", Vikas 1974—Page 7.
4. Muni Lal—"Haryana, High Road to Prosperity", Vikas 1974—Pages 29-30 & 45.
5. Douglass Ensminger.

A Big sized State—A hurdle or help to Development ?

This author unfortunately has had direct experience of dealing with the development administrations of medium and small sized states only. It did not take him long to see that the implementation of meaningful policies concerned with growth, in cooperation with the people, was possible only when a few top officers were personally involved in the programme and who could inspire their colleagues to join the venture of convincing the people to switch over from traditional to modern ways of doing things like cultivation of cereal crops or horticulture etc. The bigger the state, the more difficult would it become for the top leader to keep on to his personal involvement with the action plan. A very remote control—or control beyond the point of optimum effect—is not conducive to quick results but a line has to be drawn somewhere for determining the size of a state, a size conducive to producing quick results in development matters. It cannot be too big nor too small. But UP and Bihar are too outsized states of India, anyway.

A moment's thought will make it clear that managing a small state is much easier than a very big one: if the administrative machinery is only thinly spread over the districts with huge population, no developmental programme will receive the requisite attention and progress will suffer in the end. The path of progress is after all, not an automatic process; it has to be meticulously as well as carefully cherished and pursued and all sorts of curbs removed or correctives applied to it in the course of implementation of programmes. That element of personal attention to detail and checking the work of monitors and supervisory cadres connected with the programme, will obviously be inadequate in an inordinately big states like UP and Bihar. The former has 56 districts, with average population of 20 lakhs each, some much bigger than the others, and the latter 31 districts with average population of 23 lakhs each. It is beyond one's comprehension how a chief minister could personally know all his top field officers; even a chief secretary in UP may not know

all his collectors in the districts—much less be able to read their confidential reports every fortnight and give suitable guidance to them.

In contrast, the states like Punjab and Haryana have had a tremendous advantage in having only a few districts to tend, less than a dozen, each with a population of less than 7 to 8 lakhs on the average.

Even thirty years ago it was considered that in small states the administration would be more accessible to the people and there would be a livelier sense of local needs and appreciation of local problems on the part of the government. In matters like community development project areas, the small states would have an advantage of more favourable attitude of the people to economic development generally. It was also felt that a closer link between the electorate and its representatives might help to bring about a real unity of outlook and community of interest between the people and those charged with their governance. Lastly it was argued that a smaller state might be able to administer its areas intensively and to promote social welfare measures much more effectively than a larger state.

On the other hand, it was thought that too many small states would add to the burden of unproductive expenditure and only the creation of relatively larger states would lead to appreciable economy in expenditure on administration. A sizeable state should normally be financially more stable and more able to conform to the broad requirements of financial and economic policies formulated for the country. The protagonists of larger states even argued that experience of the working of different administrations in the country did not lend support to the view that in large states standards of administration tended to deteriorate. In fact, efficiency in administration was seldom determined by the size of the unit; other factors such as "economic and social conditions within the different areas, political consciousness, temper and tradition of the people and the political acumen and the sense of public service of the leaders in different areas also set the pace of progress and administrative efficiency".

The above debate had gone on in the States Reorganisation Commission which was set up in December 1953 and had reported in 1955. The context of its deliberations then was not economic development as such but the need to reorganise state boundaries, to make the units more coherent culturally and linguistically etc. to maintain the country's integrity. There was more emphasis on the needs of law and order and routine administration in the states—the idea of planned economic development was only just then emerging. The Commission, while making the preceding observations (culled from the Report of the Commission), never considered the needs and requirements of a strategy for economic growth, from a low base of poverty to any reasonable living standards through enhanced production and productivity. And yet the Commission had observed as under :

"In a matter like this it would be unwise to be dogmatic or rule out exceptions. When it is suggested that the weight of argument is in favour of larger rather than small states, the objective is that states should have adequate resources to assume the responsibility devolving on a fullfledged constituent unit of the Union. *This however does not mean that units should be so unwieldy as to be*

without any intrinsic life of their own or to defeat the very purpose for which larger units are suggested, that is, administrative efficiency and coordination of economic development and welfare activity".¹

(Emphasis added)

The intention here is to suggest that too big states in the Indian Union should be divided up into smaller units—not too small, not too big—to ensure that economic development can take place smoothly in those units and the state administration can, not only look after the law and order including routine problems but also pay special, personalised and in some ways even exclusive attention to developmental matters. Experience of the last two decades shows that smaller states emerging from bifurcation etc. of big states have done very well in the matter of development. Examples of H. P., Haryana, Gujarat and the southern states are there for all to see. There may be some advantages in having big states, for example political gain arising from mere size etc. but such advantages should be sacrificed for the sake of economic advancement and welfare of the people of those very states. Linguistic unity can be as much there in a small state as in a big state and, perhaps, culture and art can flourish better in states of a smaller size. Population explosion proceeding apace in the country, the big states have reached their present stage of numbers over more than a couple of decades even though they were not that big when the States Reorganisation Commission went to consider the problem of size, inter alia. Between 1951 and 1985, for example, the population of UP and Bihar have virtually doubled. But, economically, they both have gone down in per capita terms, instead of going up. It is the considered opinion of the present writer that their size has been more of a hindrance to their economic advancement than help.

The problems arising from a state of UP's size and dimensions can be reiterated once again. That the UP state is too big and unwieldy for even normal administration goes without saying. 11 crores of people and more, spread over 56 districts, with a population density of 377 (all India's 321) and a literacy rate of 27 per cent (all India's 36), more than 80 per cent living on agriculture and allied sectors and a per capita income of only Rs. 1309/- in 1981-82 (74 per cent of all India) are too many to be properly governed, administered and developed as a single state from Lucknow. Apart from land and environment, problems necessarily arise with men and if the spread² of administrative machinery, normal and developmental, is neither adequate nor properly trained or oriented in an atmosphere of socio political struggle in which people matter, however little or only theoretically, the problems will remain unresolved, or be only haphazardly solved, or could even pile up spreading misery, discontent and chaos all around. Even if that machinery be thickly spread in big states there is no assurance that it could function effectively and purposefully inspite of the top political leadership being strong, wilful and result-oriented. The problems of coordination, supervision and monitoring of progress would be overwhelming. Who would forget the oft quoted remarks of the late Sucheta Kriplani, Ex C.M. UP, that holding discussions with her district collectors (then 54, now 56) was like addressing a public meeting. How can a chief secretary or even a development commissioner of such a colossal administrative unit claim that he had even

gone through the fortnightly progress reports of his collectors carefully to give guidance or initiate action, leave aside the possibility of their knowing these nearly three score collectors personally, to be able to influence them in the right direction. And so on.

The administrative and development record of this state in the last over thirty years does not inspire much confidence in the state's ability to emerge out of the 'woods' and follow the track of economic recovery. At present whatever progress has been made in the agricultural and industrial sectors has been eaten away by the mounting population. 60 per cent of the UP's population now lives below the poverty line—this percentage was only 42 in 1960-61.

This state, infact, needs a more serious treatment than just an improvement in the developmental programme content and implementation of the type known so far in the state or in administrative and police efficiency. UP's size is a most serious handicap; it is too big to be managed successfully even by a political commissar ! It must be divided up into three or even four smaller units on the basis of contiguity, economic coherence and administrative manageability. Late Mr. K.M. Pannikar, a member of the States Reorganisation Commission referred earlier, had supported the suggestion of reducing the size of this state, with the following remarks :

"UP's development was poor, there was neglect and inefficiency and these factors were not unrelated to its size. The administration which had such a large population to look after could not be in the best position to attend to the particular regional problems.....

One of the commonest arguments advanced before us by the leaders in UP was that the existence of a large powerful and well organised state in the Gangetic valley was a guarantee of India's unity, that such a state would be able to correct the disruptive tendencies of other states and to ensure the ordered progress of India. The same idea has been put to us in many other forms such as that UP is the backbone of India—the centre from which all other states derive their ideas and culture etc. It is not necessary to examine these claims seriously for nothing is more certain to undermine our growing sense of unity than this claim of suzerainty or paramountcy of one state over others."

This was said about 30 years ago. The hollowness of the arguments advanced before the Commission in favour of a status quo for UP state is more patent today than it was at that time. Today, UP has become too big and clumsy a weight to carry by India. And such a weight, along with that of the present Bihar state will in any case be difficult to carry into the 21st Century. On its own the UP state will not be in a position to accept the invitation to enter the coming century, extended by the President of India in his address to Parliament, on behalf of the new Government at the Centre (March 1985). On the physical plane, fancy an Indian convoy consisting of jet aero-planes, cars, buses, tractor trolleys, tongas and bullock carts trying to enter the 21st Century all together, inspired by the desire to get in and on ! And if UP and Bihar cannot, the country also will necessarily stay behind.

"The reorganisation of the UP state into 4 or 5 manageable states is a historic necessity. It will open the door for each constituent to leap forward, as we know from the experience of Gujrat and Haryana, which have, after they were let free, enriched Indian development without affecting the development of the parts from which they were separated. Formation of smaller states is not a disruptive step. It is a constructive step. Indeed given UP's dismal record, it is an imperative or else not only UP but the whole of India will remain stuck to the 20th Century. If UP can be moved, India will move"³

Politically, the suggestion may not suit the powers that be. The present author being only an ex-administrator by training and experience—and not a politician—would hazard to put forth the idea that, if a division of the state may not suit the political purpose, let this state be divided in three or four administrative units, each with full autonomy, except in the matter of a few well defined functions reserved for the parent state—leaving all residuary items to the regional units. The idea is at best a half-way-house, may be worth a trial only, to begin with.

The author had recorded the following in 1972, in an article on "Removal of Poverty—Some Suggestions" which supports the same idea as above :

"State like the UP and Bihar are outsized, to an extent that administratively they are, perhaps, unmanageable. No chief minister can tend well a state with 10 crore population nor can a chief secretary even know his district officers if there are 50 or 60 districts to look after. The one obvious answer may be the break up of such states into units of smaller size, of 2 or 3 crore population only. In fact, experience indicates that states thus broken up have shown fresh vigour for development and progress. Haryana is an example though it may not be comparable with the states that may be carved out of UP, in all respects. The point to emphasise here is that, since the intensity of administration, including its supervisory cadres, in a big sized state is thinly spread, the problems of people donot get due attention of the administration and since today every voter has the right to be heard and have his grievances redressed, the answer would lie in carving out smaller states, with their own paraphernalia, from top to bottom.

In the alternative, if for some sentimental reasons or overriding political considerations, such a break up is not considered feasible, the big states may be internally divided into 3 or 4 regions, each placed under a deputy chief minister, or a senior minister, with its own administrative set up, including an additional chief secretary on top, assisted by other additional and lower rungs of the official cadre. Only some well defined functions may be reserved for the state government—functions relating to parliamentary legislative work, taxation collection, budget making, allocation of plan funds, plan coordination, recruitment to top state services etc.—the rest of the detailed administration, including plan formulation and implementation as well as management of the service sub-cadres becoming the responsibility of the regional governments. The details can be spelt out further. The overall objective would be that neither the

state nor any unit or subunit of a state administration should be too clumsily large; instead, these should be so manageable that the ministers and the top officials can have a first hand knowledge of the people and their problems. It follows also that the size of a district in the state should not have a population of more than 5-10 lakhs each. The ideal size, in fact, would be 4-5 lakhs only as borne out by experience. A reforming and reorganisation of district administration is badly overdue. Smaller districts certainly receive better attention all round. Expenditure on this reform will be worthwhile for democracy as well as for economic development".⁴

Even in developed societies, the units of administration in a federal set up are much smaller than in India. The USA has as many as 50 states, to manage a population of 250 millions only.

NOTES

1. Report of the States Reorganisation Commission 1955—p. 61-62.
2. On the subject of spread of administrative machinery, see a statement added at the end of this chapter, indicating the (state wise) number of state government employees, teachers and other employees of the local bodies and aided institutions, as on 31.3.82. It also indicates this number as a percentage of the population of the state (1981). It will be seen that leaving out the very small and border states like Manipur, Nagaland, J & K and Himachal etc. the medium and big states having a percentage higher than 1.5 are only Gujarat, Haryana, Kerala, Punjab and Tamil Nadu. And these very states are the ones which have a high percapita income. The connection is obvious; when local problems get attended to and development takes place, people/officials get in position to support fresh activity and the administrative spread increases. It certainly does not imply that more staff will automatically mean more development. But it does show that a higher level of growth in the state involves more public servants running around doing their allotted tasks in accordance with some overall scheme of things.
3. L.C. Jain's article "The Drag", Seminar New Delhi—April, 1985.
4. The author's Article "Removal of Poverty—some suggestions and administrative implication"—The Indian Institute of Public Administration, New Delhi—Journal 1972.

STATEMENT

Number of State Government Employees, Teachers and Other Employees of the
Local Bodies and Aided Institutions as on 31.3.1982

State	Popula- tion 1981 (0000 persons) A	State Gvern- ment em- ployees	'Employees of local Bodies		Total (2+3+4) B	B as % of A
			Teachers	Other		
1	2	3	4	5	6	7
1. Andhra Pradesh	53,404	420189	176058	38864	635111	1.19
2. Assam	19,903	219296	5971	41275	239542	1.20
3. Bihar	69,823	660264	8039	34067	702370	1.0
4. Gujarat	33,961	392322	140392	NS	532714	1.57
5. Haryana (P)	12,851	197183	4395	11692	213270	1.66
6. Himachal Pradesh (P)	4,238	84709	(0)	2868	87577	2.0
7. Jammu & Kashmir	5,982	156804	3088	8469	168361	2.8
8. Karnatak	37,043	389540	(0)	81228	470768	1.27
9. Kerala	25,403	435865	NA	NA	435865	1.71
10. Madhya Pradesh (P)	52,132	542825	(0)	43554	586379	1.12
11. Maharashtra ⁰	62,694	412594	(0)	308108	720702	1.15
12. Manipur ¹	1,434	22231	(0)	7362	29593	2.1
13. Meghalaya	1,328	22426	9320	—	31746	2.4
14. Nagaland	773	45270	—	153	45423	5.9
15. Orissa	26,272	230085	(0)	135684	365769	1.4
16. Punjab	16,670	265573	NA	NA	265573	1.6
17. Rajasthan	34,103	367216	47236	44553	459005	1.34
18. Sikkim	316	11588(NP)	(NS)	(NS)	12725**	4.0
19. Tamil Nadu	48,297	557394	129828	108423	795845	1.65
20. Tripura 00	2,060	85150	(0)	8336	91486	4.44
21. Uttar Pradesh	1,10,858	765782	422881	210693	1399356	1.26
22. West Bengal*	54,485	362000	323000	115750	800750	1.47

NA = Not available

* = As on 31.3.1981

0 = As on 1.7.1981

00 = As on 31.12.1981

1 = State Government did not furnish information. Taken from the Finance Commission Report—1978.

** = Adjusted to provide for Plan employees.

NS = Non Plan (1982-83).

NS = Not separately specified by state government.

P = Reported provisional by the state government.

(0) = Included under "Others".

Source : Information received from the state governments ; statement prepared for the Eighth Finance Commission.

Bureaucracy and Development

A. Its Theoretical Aspect

Development administration, according to experts like Edward Weidner, is synonymous with an action-oriented, goal-oriented administrative system.¹ It includes the working of new agencies such as planning organisation, development corporations, the reorientation of established agencies such as department of agriculture, the delegation of administrative powers to development agencies and the creation of a cadre of administrators who can provide leadership in stimulating and supporting programmes of social and economic improvement. It is also an aspect of public administration which focuses on government-influenced change toward progressive, political, economic and social objectives.

Since its main concern is with the management of change in the countries whose major national goal is development, development administration should naturally function more as an agent of change than as an instrument of stability and continuity. A bureaucracy steeped in the tradition of old style colonialism, as of India in 1947, cannot *normally* deal with development situations requiring risk-taking, quick decision-making, innovation and creativity, especially in a free democratic state committed to a socialistic pattern of society, with development as a major goal.

It is believed by all concerned that economic development, if it is to be carried out by a massive intervention of the public sector, requires a breed of administrators different from those trained only in the maintenance of law and order and revenue collection. These new type of administrators would be more "freewheeling", less adhering to administrative form, less attached to the importance of hierarchy and seniority, with different kinds of values, orientation and attitudes to govern their behaviour. In developing countries it is necessary to have these cadres of adminis-

trators because there are no other social or political institutions—like in developed countries—to accomplish the economic goals.

A lot of debate and research has gone into the question whether the Indian bureaucracy, as it is, is capable of delivering the developmental goods in our conditions. Is the Indian bureaucracy static or dynamic? Broadly, the studies show that Indian administrators have been well adjusting their behaviour and outlook to the exigencies of new situations though their reaction time has been some what longer than necessary. Perhaps, the behaviour of the individual bureaucrat is dependent upon his own cultural and value orientations, beliefs and work-ways. A study conducted in 1980-81 has put this in the following terms :

“As all officials are human beings, possessing value judgements and biases, human values and orientations are regarded as enduring long term goals which require behaviour adaptation. Since the values of an official form part of his work environment and orientation and since [the value systems of the civil services in India have been undergoing changes due to factors like change in educational system, processes of urbanisation and industrialisation, parliamentary democracy, impact of mass media etc, the pace at which the developmental goals could be realised in India depends mainly upon its official's orientation towards certain types of values and the extent to which their own values are consistent or in contradiction with values necessary for realisation of new goals of a democratic welfare state.”²

This very study has made the following suggestions to mould the existing bureaucratic system to serve the needs of a development administration :

- (i) A three pronged policy strategy to make certain changes in the structural component of the bureaucracy by (a) reducing the number of levels in the decision-making process, especially in the organisation of field offices ; (b) by visiting the officials in the field establishment with requisite authority and power to take spot decisions in the execution of development targets ; and (c) making the functional division of the work between the officials such as would encourage team work with a determined leadership and direction in the implementation of developmental goals. There would need to be more open communication and professional mobility among various levels of officials.
- (ii) Necessary to “make certain radical changes in the social process of the incumbent officials if their orientation towards development has to match with the reciprocal perception of the beneficiaries' confidence in their capabilities and orientation of helpfulness”. Can be done by training and refresher courses.
- (iii) Need to choose development administrators most carefully since they are necessarily to be an organisor, leader, a pathologist, a politician, an expediter, a specialist, a change-agent and a reformer—all rolled up in a single personality, besides wielding enormous power and prestige which is to be

used for public good. These people have to be trained and reoriented in outlook and behaviour from the day they enter service. They have to develop a 'client orientation' attitude-built on a note of mutual confidence with the community they serve.

- (iv) Necessary to effect changes in the officials socio-personal, socio-administrative, socio-cultural value systems, in order to effect desired changes in his behaviour towards his own colleagues, subordinates, the people and political leaders with whom he comes in daily contact. A collaborative effort of the officials, the common man and public leaders would need to permeate the developmental process.
- (v) The developmental official must, by training, fully project his public image of an impartial and honest functionary and, at the same time, be closer to his subordinates and other segments of society with whom he has to work, without sacrificing his concern for public interest against the individual interest.³

Ultimately public bureaucracy stands in need of ethical sensitivity in order to serve public interest which can best be served "when public policies are not bended towards any special interests and the various conflicts of interests are supplanted or reduced by law, organisation and process."⁴

B. Its Operational Aspect

In 1980-81, the Centre for Policy Research, New Delhi, in collaboration with the ICSSR New Delhi, did a study on Development Bureaucracy dealing essentially with the skills and capabilities of bureaucracy in development. Though the study was based on the data collected from only two districts in two different states viz., Karnal in Haryana and Gorakhpur in UP—some useful conclusions were reached for wider policy purposes.

The broad question before the study team was : how far the bureaucracy as a system, with its rules, regulations, relationships and behaviour, was capable of dealing with the various functions of development ? The team was also to identify those factors which were responsible for relative success of the efforts made at the grass roots level and their broader theoretical and policy implications of governmental systems and development. The study was confined only to agricultural development in the above two districts which had a comparable development potential but with very diverse performance record.

The Report of the study team dealt with the growth of agricultural development strategy in India since 1959 when the Ford Foundation Team of Experts had given their "Crisis Report" which led to the IADP/Package concept. The subsequent more elaborate programmes like the IAAP, HYVP, SFDA, MFAL, CADP, DPAP, and Dryland Farming Programmes were also described briefly. The improvements in agricultural programmes of production, including productivity per ha, were also noted for the period 1960-61 to 1977-78.

"The choice of the two districts—Karnal and Gorakhpur—was largely based

on their natural endowments in terms of their agroclimatic conditions, especially their developmental potential *which in the view of many senior personnel was considerably similar* (emphasis added now); what then accounts for difference in their respective performance in relation to agricultural development? In particular, are there any major administrative factors responsible for the relative success or non-success of the agricultural development programmes in the two districts?"⁵

The main objectives of the study were framed as under :—

- (i) to examine the adequacy of the various dimensions of the generic bureaucratic system of handling the task of agricultural development;
- (ii) to study the attitude of the bureaucracy towards the developmental task assigned to it and towards the people whom it was supposed to service;
- (iii) to assess the level of skills and capabilities of the bureaucracy implementing the programmes and
- (iv) to observe and evaluate the actual behaviour of the bureaucracy in implementing the programme including its relationship with the citizen clientele.

Focus of the Team was on the general programme. It investigated more specifically the strategy of the organisation for agricultural development in the two districts, the design of the administrative system in both and the structure of day to day administration, the skill and capabilities of the bureaucratic administrators and their attitudes and behaviour, both towards the task assigned and towards the citizens clientele.

The study particularly noted that the IADP in Karnal was better designed than the IAAP in Gorakhpur. In the former, the supply of most vital inputs like seeds, chemical fertilisers and pesticides was centrally handled by HAFED in Karnal, as against four different agencies in Gorakhpur. Karnal had 186 sales depots compared with only 150 in Gorakhpur even though the latter was twice in area and three times in population. Similarly cooperative credit was more easily available in Karnal than in Gorakhpur. 78 per cent of the net sown area in Karnal was irrigated as against only 53 per cent in Gorakhpur even though the irrigation potential there was also extensive. In Karnal all villages were electrified as against only 22.6 per cent in Gorakhpur. Network of roads was also much better in Karnal. In the matter of dissemination of information, there was a full-fledged information wing in the office of the DDA, with a plan projector, a slide projector, documentary films and slides, one audio-visual van and three jeeps. Gorakhpur had only one jeep and no other facilities for this work.

In the matter of organisational strategy, the one adopted in Karnal was found to be highly pragmatic and result-oriented, responsible for the successful implementation of the development programme. It consisted of a clear-cut division between extension functions and supply functions—the latter entrusted to autonomous corporation like HAFED and Haryana Agro-Industries Corporation. It was not so in Gorakhpur. Then there was a proper command, control and coordination of

operations in Karnal—all under the DDA—to ensure a smooth and cohesive working. In Gorakhpur, on the other hand, there were separate parallel set-ups for extension, cooperation, minor irrigation and plant protection etc. No cohesion, no compactness and little coordination.

Conclusion

The study concluded that development bureaucracy did indeed have a significant share in the actual delivery of development in the field—the actual performance being related to a host of *intra* bureaucratic and *extra* bureaucratic factors. Bureaucracy included the civil service with its entire system of administrative rules and regulations, planning and implementation processes. Though the district administrative systems were comparable in both the districts, there were marked differences in performance. The two districts had a strikingly different approach to the question of administrative strategy and planning which in turn meant a different administrative design at the state level.

“In Karnal the systematic consciousness in trying to develop a deliberate strategy for reaching the agricultural developmental programme to the farmer, administrative planning to deliver the services whether of extension or input variety and maintaining a more effective coordination between different programmes is clearly superior to that of Gorakhpur”.

“In Gorakhpur, the administrative system is of the old C.D. Programme variety which became obsolete years ago.

“The forte of the administrative strategy in Karnal appears to be an explicit recognition of the state of agricultural development at the local level, the level of the bureaucratic skills required to handle the task of development and the limitations of the local bureaucracy within which the programme had to be administered”⁶.

Conscious efforts were made to develop an implementation machinery which was directly related to the overall administrative strategy. In Karnal it was more functional; in Gorakhpur it was quite a bit dysfunctional.

The Study concluded that—

- (i) the basic parameter affecting bureaucratic performance is the bureaucratic or the administrative strategy and planning,
- (ii) in other words, the administrative “how” is as important as the policy “what”;
- (iii) basically, bureaucracy as a system can be designed to perform developmental functions quite adequately, even in a diffused sector such as agriculture;

The most important requirement is one of deliberate and conscious development of administrative strategy—a dimension which is commonly absent in the culture of the administrative system—not a mere grafting of developmental functions on the old regulatory administrative system will do.

- (iv) to the question "must it be bureaucracy to do the developmental job? The answer is that for India the choice was made in the Constitution itself. There is no way out of the democratic option for the time being, though alternatives could be worked out.

The total upshot is that the present administrative machine in the country is quite capable of taking up developmental programmes provided it is properly trained, motivated, organised, supervised and monitored. There is need for an enlightened political leadership to inspire this machine suitably. In future recruitment, proper steps could be taken to choose persons carefully and then give them intensive in service training and motivation.

NOTES

1. Edward W. Weidner "Development Administration—A New Focus for Research"—included in Paper in Comparative Public Administration, Ann Arbor,—Michigan Institute of Public Administration 1962 p. 98.
2. R.B. Jain and P.N. Chaudhuri's "Bureaucracy and Development"—Centre for Policy Research, Chanakya Puri, New Delhi p. 20-21 (unpublished).
3. Emmette S. Rodlord's "Ideal and Practice in Public Administration" (University of Alabama Press 1975).
4. Concluding Chapter of "Bureaucracy and Development" *ibid*, p. 319-320.
5. Dr. V.A. Pai Panandikar "Development Bureaucracy" (along with R.N. Bishnoi and O.P. Sharma) Centre for Policy Research, New Delhi March 1911, p. 353.
6. The above is based on "Development Democracy" *ibid.*, (unpublished).

Extent of Administrative Involvement in Intensive Agriculture at the Field (micro) Level

Administrative (government) involvement in intensive agriculture at the field level started in the country in the early 40s—really with the launching of the Grow More Food (GMF) Campaign in 1943. In 1950-51, this campaign was modified into an Integrated Production Programme (IPP), to include crops other than food-grains also. The measures devised to attain the First Plan objectives aimed at securing equity/social justice in the rural areas. The agency for implementation was CD/NES through a coordinating Village Level Worker (VLW) at the bottom rung. In 1957 was brought in the Panchayati Raj (PR) set up for rural development. With this there were now three agencies in the field, viz., the Cooperatives, CD/NES and PR, to promote agricultural development. In retrospect one sees that none of them had by itself any significant impact on agricultural production. CD/NES had, however, led to an awareness of new inputs like improved seeds, fertilisers etc. but resources being inadequate, their impact on the problem did not go far. There was no new technology to be spread as such. The cooperatives were dominated by the rich farmers and the PR institutions were vitiated by political factionalism and its members pre-occupied in a race for local importance.

Whatever the agencies in name, the gut agents in the field were provided by the agriculture department the set up of which, for decades before 1947, had consisted of the Director/Deputy Directors (DA/DDA) of agriculture at the Headquarters and EADA/DAO (Extra Assistant Director Agriculture/District Agriculture Officers) in the districts, with a few agriculture inspectors in the field. Considerable expansion in these ranks took place in the 50s when the CD/NES experiment was launched. Further expansion took place when the PR structure was introduced with its Block Samities and Zila Parishads all over the country, with VLWS, each working in ten or more villages for helping agriculture and other activities, and a Block Development and Panchayat Officer (BDPO) at the block

level helped by some agricultural inspectors. Hitherto, however, agricultural activity as such was considered only as a part of the overall economic developmental activity, deserving of attention as one of the subjects concerning people's welfare. All the same, the district remained the basic unit of agricultural administration.

CD/NES programme was treated as the principal vehicle of rural development. The thinking behind it was that official departmental machinery by itself could not carry out the development programmes which called for a great deal of initiative and participation on the part of the people themselves. The rural masses of people were treated as the chief producers of wealth in the country, one major resource for development, in fact as the chief entrepreneurs of all local involvement. In the 50s the country was given to a lot of philosophical idealism, one recalls.

Ford Foundation Team and some other American agencies—these were the Kennedy days in early sixties—egged this process on in good faith and in good measure. Maintaining very correctly that increased agricultural production was going to be the main theme of CD/NES (and later of the P.R. programmes) they felt that the need for rapidly increasing food production could not be guaranteed under the sole direction of government administration. Democratic decentralisation, in the shape of PR, was introduced in order to decentralise responsibility, utilise and develop local area and local group initiatives. The logic was :

“This is so partly because India is discovering through experience in her rural development programmes that neither (i) logical planning which has been done nor (ii) efficient bureaucratic administration which she possesses, accomplishes the basic task of increasing the food supply rapidly enough to greatly improve man's consumption.”¹

The Team came to the conclusion that the above two things were not adequate to engender dynamics in hundreds of millions of Indians. “Only the willing and enthusiastic endeavour of each cultivator family to farm more efficiently will create wide-spread dynamics in rural areas. The development of hundreds of thousands of largely self-directed local groups will provide the foundation stones of a basic democracy—Now India has established the framework of a CD/NES programme which provides a vehicle or machinery by which rural progress can be carried forward by democratic methods and procedures”.

Going into the reasons for the village people not taking readily to new agricultural practices, a view was expressed that little effort had been made to discover and to understand the most effective means of spreading or diffusing information about superior methods of agricultural production and not even indigenous means of spreading information had been utilised.

“It has been due to insufficient understanding and use of social skills in the motivation of village people plus an inadequate understanding of the network of human relationships in villages and the ways by which both technical

assistants and administrators can efficiently communicate with those whom they seek to serve."²

Answer to these questions will be found only if Indian bureaucracy assumes responsibility for the relatively simple types of research by which these answers can be found, as is done in well-established democracies. If that is done, the Indian bureaucracy will change from the practice of *guiding* village people to an understanding of how to *motivate* village people and how to utilise long-established social structure of village communities as a vehicle for promoting development and democracy."³ In this process the bureaucracy need not sacrifice its administrative integrity, even though it loses some of its elite social status and comes nearer to the masses.

This was the real crux of the matter. The administrative leaders in the field, inspired by a selfless political leadership, must be able to convince the people of their honesty of purpose, with devotion, application and personal example, apart from the logic and general acceptability of the plan proposals by the people. And while expecting the people to do their part of the job in the game of development/agricultural production, the administration itself must deliver the goods in time, in the shape of inputs and services.

When the CD/NES and PR both more or less failed in their generalised approach to agricultural development, Intensive Agricultural Development Programme (the IDAP), called Package Programme for short, came into the picture in 1960, first on an experimental basis in 7—then in 16 districts (one district project in each state) in pursuance of the recommendations of the Ford Foundation's Food Crisis Report, 1959. In actual fact, administrative involvement in agricultural production became more intense with the IADP—followed by IAAP (Intensive Agriculture Areas Programme) and HYVP (High Yielding Varieties Programme)—programme which formed a part of the New Strategy in Agriculture, initiated and followed in the sixties and with which we have already dealt at length in Chapter 3. Field staff was increased considerably with each programme in the covered areas; even then their inadequacy was acutely felt when the Green Revolution concept came to hold the farmer's imagination, in some states at least. Simultaneously the setting up of the agricultural universities in various states was of considerable help in providing the new expertise and in solving the technical problems arising locally, peculiar to the soil and natural environment, apart from their help in extension work.

Scientific agriculture is a highly specialised affair and consists of various subject matter fields even within one branch of agriculture. Competence in different agricultural disciplines was essential for tackling the numerous problems arising in the field. The subject-matter specialists were available only at the district level, even under the Package Programme. Difficulties arose also from the fact that, where this staff was placed under the PR institutions, their utility really depended on the interest taken in the programme by the locally elected representatives; moreover, the unified technical and administrative control at the district level suffered too. Even at the latter level, the question of coordination of various

types of expert staff connected with intensive agricultural production started looming larger than before. The good old district collector—that jack of all trades—was available but he was generally very much preoccupied with other work. The appointment of a wholetime CADO (Chief Agricultural Development Officer) was suggested to control and coordinate the working of district officers in various agricultural disciplines. A doubt arose whether he would enjoy enough prestige to control so many multitasked experts in the field.

With the same logic, at the block level the BDPO was to be replaced by a BADO (Block Agricultural Development Officer, directly responsible to the CADO who would act as a coordinator at the block level for agricultural production. The VLW will devote time entirely to agriculture. Other activities of development would need to be looked after separately.

Similarly at the state level, the appointment of an APC (Agricultural Production Commissioner) was suggested, next only to the Chief Secretary in rank, to plan, direct, guide and coordinate the activities of various departments connected with agricultural development. A deputy Chief Minister was to look after this important portfolio at the ministerial level.

Some states adopted these changes wholeheartedly—others did not. As time went on, and problems or the need arose, further changes were made not only to keep up with the increased activity but also to ensure control and coordination. The strength and extension pattern of staffing in departments and directorates was, however, linked with the plan schemes and not determined by any systematic plan for strengthening the administrative structure, keeping in view the needs of agricultural development of the state as a whole. The increase in the spread of staff, therefore, lacked some sort of a rationale and coherence. Such situations arose at the level of the central government also. Sometimes food, agriculture, cooperatives, forestry, rural development and irrigation were all lumped together under one ministry, to ensure coordination. Then this system was changed and the ministry broken up into small ones, to meet political exigencies and so on.

This narrative is, by no means, intended to be a comprehensive account of all the organisational changes that were made at the centre and in the states to handle the important subject of modern agricultural production. As expansion took place and the spread of activity increased, the staff also multiplied in various fields and disciplines, throwing up problems of coordination, unified command and control. The pattern of staffing was generally uniform in all the states and yet it was only in some states that satisfactory results were forthcoming on the ground. In the four states selected for this study only Punjab and Haryana made good, UP did well only in its western region, having done only so-so in the rest of the state. Bihar did not budge much. Why? What was wrong or had gone wrong with these two states of UP and Bihar, having almost 25 per cent of the country's population? Was there some defect in the organisational/institutional arrangements made for ushering in the Green Revolution or was there any deficiency in the conceptual frame-work of these arrangements? Or were there any over-whelming reasons in the sociological, historical and traditional background of these two states which stood in the way of the real effort, not only on the part of the local political

leaders themselves but also the mass of the people residing there? This could be probed further, but as it is, the conclusion is obvious that the political leadership had let down the people and failed to create conditions in which the mass of them could get down to the job of increased production and productivity.

25 years ago the PR (Panchyati Raj) Institutions were accepted in principle as the foundation of political and economic decentralisation. It was hoped that if initiative was passed on to them for planning and implementation of development programmes, people will come forward with their cooperation in right earnest and positive results would be forthcoming in quick time. Actually not much progress was made on the ground; even till today the district level planning means only a collection of centrally conceived departmental schemes broken up into districts and at the block level it is a little more than a rather disjointed exercise in implementing these schemes through a multiplicity of departmental representatives. In fact, the PR institutions have all receded into the background and the developmental activity, except in some welfare matters, has now been distributed among variously defined target programmes like SFDA, MFAL, DPAP, CADP, IRDP, and so on. The effect is [that, even though these programmes in themselves are useful, a tendency towards a sort of centralisation is now growing and the concept of decentralised planning and implementation has been the sufferer, yielding place again to departmental working, however coordinated or coordinating it may be in theory. But it also remains true that departmental hierarchies would not be able to handle the area departmental plans which require a coordinated working at all levels of rural disciplines—a job as complex as a large industrial enterprise.

Let us see what the Sixth Plan document has had to say on this subject. It is stated on page 85 of it that “a clear strategy will have to be evolved to ensure that agriculture receives a very high priority in all policies and programmes.

“The postulated increase in output is expected to result from increases in area under irrigation and by a substantial increase in the consumption of chemical fertilisers and adoption of a systems approach for consolidating the gains already achieved extending the benefits of the new technology to all categories of farmers and all regions.”⁴

It stated that scientific management of agriculture would require a highly orchestrated effort on policy formulation and implementation on the part of the agencies concerned with the development of packages of technology services and public policies.

“It will be necessary to make arrangements for horizontal linkages at the block level. The task of planning and implementation for development programmes at the district level is acquiring greater complexity.”

“The planning at the block level will be further strengthened in the Sixth Plan. The programme will be made area-specific at the grass root level, based on local endowments and potential for growth and further employment.

The object of these plans will be to integrate various programmes for optimal utilisation of local endowments with plan objectives and local needs."⁵

The block level has to be the primary area for planning in which case block level plan would need to be in harmony with the district and state plans. It would be necessary, apart from decentralisation of administrative machinery providing for coordination at local levels, to ensure that at every stage of planning and implementation there is full participation and involvement of the people. The PR Institutions would need to be strengthened to become institutions of democratic management of rural development, both at the district and block levels. The direct support and cooperation of the elected representatives of Panchayati Raj is vital to success.

In actual fact the PR institutions have remained ineffective, at best engaged in things like subsidy distribution. The failure to make greater progress with area development programmes could be traced, to a large extent, to serious inadequacies in the more centralised planning and implementation systems at the state level and the lack of supporting policies. Such programmes would require not only strong commitment to measures like consolidation of holdings, some land reforms but also a complex network of infrastructural investments for the development of ground and surface water resources for irrigation and drainage, integrated rural energy system and adequate communication facilities etc. In some of these tasks the overall planning may have to be at a centralised level and only implementation at the local level. It may be possible to do away with much decentralisation in the case of small states like Punjab and Haryana, but in the case of big states like UP and Bihar, local development planning will prove effective only on a decentralised basis. Whether the task is taken up at the state level or at a sub-regional level in a state, would depend on local conditions and preferences of that state. In bigger states there would certainly be a strong case of decentralisation of planning focussed on small regions, identified with regard to agroclimatic conditions, topography, density of population, level of social and economic development—above all, on the potential available for development of local resources in the broader sense.

KN Raj believes that

"There is an essential complementarity between centralised development planning within states and the decentralised segments of it and the need for evolving organisational arrangements that would help the technical and service personnel associated with each to establish mutually [advantageous] links without getting distracted from their basically different functions or coming in the way of each other".⁶

We must also seriously consider the need of giving a real political status and administrative autonomy to the PR institutions, even by going beyond the Directive Principles of the Constitution. This would imply specific statutory provisions relating to local government, definition of the area of responsibility and power, indication of sources of finance and constitutional safeguards necessary. Only then

decentralised planning and implementation of development scheme at the grass-root level will take place. Government departments will not formulate such scheme at the state level, thus avoiding a fragmented approach through vertical lines of control and horizontal coordination.

An Experiment in Decentralised Planning—UP

It is gratifying to note that the UP state government has already embarked on a bold experiment in decentralised planning at the district level. In 1982-83 it started the formulation of district plans, with a view to carrying development to the people and generating development from within, as it were. People were to be involved directly in planning and decision-making on their developmental matters.

The intention was to initiate a development approach based on different physico-geographical and economic conditions, with the district as a convenient unit. In such an approach local resources, initiative, potential and capabilities could be taken into account. "The basic aim to implement district plans was to divert attention from a 'backlog problem-oriented' concept focussed on regions which had its political overtones, to a resource-cum-need based concept focussed on smaller areas."

District planning was to start from below, within the frame-work of certain broad guidelines coming from the state government. (The pattern had been set by the Maharashtra government in 1972-73, as a corrective to regionalism). The districts were authorised to formulate their annual plans, keeping in view the aspirations of the people, but adhering strictly to the national and state plan priorities. Schemes under district sector included mainly programmes of agriculture and allied sectors, rural electrification, road building, small industries, drinking water etc.

On an empirical basis, the state government decided to earmark 30 per cent of the total annual plan funds/outlay for district plans on defined subjects and divided the amount among the districts on a rational basis, taking population (50 per cent) and other socio-economic indicators (like scheduled caste/tribes population, number of marginal farmers and agricultural labourers, rural village electrification and some factors) into account, with a view to evening out imbalances and backwardness etc.

There is no local taxation at present; all district plans are being financed by the state government. The district plan schemes (in the decentralised portion of the state plan) are sanctioned by the state headquarters by 15 April. There is a district level planning and monitoring committee consisting of a cabinet minister as chairman, all local MPs, MLAs, collector, DDO and district level officers as members, to finalise the district plan under the guidelines prescribed by the state government and to allocate departmental outlays between blocks on the basis of prescribed norms. The second committee is called the district plan coordination and action committee, consisting of the district magistrate, DDO, economic officer and all district level officers of development departments, to formulate the district plan, review its progress and prepare proposals for reallocation of funds. There is provision for a third committee at the district level—called the executive committee chaired by the district magistrate, with senior most member of the development

department and a representative of a lead bank as its members, to decide about the provision of institutional finance for IRD and other such schemes. Then there is divisional level committee chaired by a cabinet minister, with commissioner as deputy chairman, with all districts magistrates and divisional level heads of all development departments, a representative of a lead bank of the division as its members and joint development commissioner as its secretary, to review and approve the district plans and their implementation, to establish coordination between departments to monitor and supervise actual performance of departments against prescribed targets and lastly to draw up appropriate credit plans for mobilising maximum institutional finance for implementation of district plans.

With this type of decentralised planning the state plan is distinct from the district plans. Funds for the latter are not routed through the heads of departments but are allocated to the district directly. Considerable administrative and sanctioning powers have been delegated to the district authorities. Certain powers of the finance department for reappropriation of funds are proposed to be given to the divisional commissioner, amending the Budget Manual. Moreover, there is a proposal to further strengthen to planning cell at the district level in committee No. 2.

District plans are received and checked at the level of the divisional committee which is attended by a representative of the state planning department also. At the state government headquarters these plans are thoroughly examined further and brought into the state budget.

It will be seen that there is no statutory authority to prepare the district plans and implement them. This job is carried out informally at the executive level under the orders of the state government. So far there is not any representative of the panchayati raj in the planning and monitoring committee as member though they individually may have adequate voice in the district planning process. Presumably this is so because all the zila parishads and block samities too are in a state of suspended animation, having all been superseded long ago.

This is a bold experiment but it suffers from some inevitable constraints like lack of data, lack of adequate resources, lack of trained personnel and lack of coordination between departments etc. This is perhaps, a temporary phase. The biggest snag is that the local representatives are out of this experiment, for the time being, may be. A "marriage" of this planning process with the experiment of democratic decentralisation, viz. panchayati raj institutions, in a statutory fashion will be an objective to be wished for. That will certainly be an improvement on the present scheme of things.

The above narrative, somewhat lengthy and tedious, would go to show that the job of agricultural development in the real sense is quite a complicated affair. Whereas it is easier sitting in the state secretariat, and in the departmental head offices, to draw up plans and programmes for input supplies and services, the problems arise when efforts are made to share those plans etc. with the people and to popularise them for adoption in the field. Various experiments have been tried over these two decades and modifications made in the institutional arrangements in various states in different ways; the fact emerges that decentralised planning, in keeping with the local needs, conditions and facilities etc. at the district level and later at the block level, carried

out in cooperation with the elected representatives of the people and then implemented, will have a good chance of success on the ground provided all allied inputs and services have been arranged in advance by the government and the broad infrastructure created in the shape of irrigation, roads, power and consolidation of holdings etc. over a period. Above all, again the political will of the state leaders would be paramount as an input.

NOTES

1. Douglass Ensminger and Carl C. Taylor's "India's Roots of Democracy"—Orient Longman, New Delhi, 1965, p. 668.
2. & 3. Douglass Ensminger and Carl C. Taylor's "India's Roots of Democracy"—Orient Longman, New Delhi 1965, p. 679-680.
4. India's Sixth Five Year Plan Document, p. 85.
5. India's Sixth Five Year Plan Document, p. 92-93.
6. K.N. Raj, "Decentralisation in Perspective" Mainstream, New Delhi, dated 22.12.84.
7. U.P.'s Draft Annual Plan, 1984-85, Vol. i, p. 100.

Some Aspects of Implementation and Working Procedures

Modern agriculture is a very complex, enormous and multi-dimensional enterprise encompassing several factors which interact and condition production. A changeover from traditional to modern cultivation or the success of the Green Revolution itself in Indian conditions, would require many factors, including the efforts of the top level, wilful and determined people, at right and crucial times. The experience of Punjab shows that a tremendous administrative push, backed by scientific advice, was made available right through; more than that were the correct decisions which put the entire effort on the right track, with a crucial direction at the nick of time. This correct and timely decision-making is not an easy task—it needs a lot of knowledge and background about the whole process involved, how the field workers and the farmers would react and how the numerous inputs would be made available when a programme of agricultural development is launched. Though scientists develop the technology, its ultimate adoption, and later concrete returns from it, would depend on the interaction of the entrepreneur farmer with extension workers, institutions and suppliers. Whereas modern technology is “scale neutral”, viz. that it can be applied to all sizes of farms, it is not “resource neutral” nor “input and management neutral”. Depending on the arrangements for credit and supplies made by the extension agencies, the entire lot of farmers in an area will not adopt the particular new technology all at the same time. There will be a mixture of modern and traditional ways of cultivation in the earlier stages, working side by side.

The Punjab experiment shows that once a political decision is taken to augment/modernise agriculture, ways and means get found to collect resources for the programme and after taking broad administrative decisions and guidelines, supply services for credit, hyv seeds, fertilisers pesticides etc. are organised in a manner that the needs of the farmers can be met after the extension workers in the field have aroused sufficient enthusiasm and demand among them. Simultaneously, schemes are

set in motion for tackling long range problems like consolidation of fragmented holdings, irrigation (surface as well as ground water), rural electrification, link road construction to help marketing and so on. As the operations get into a practical swing, decisions are made as quickly as situations arise, so that the main programme does not get a set-back in any way, even if such decisions mean a financial loss to the government initially. Dr. M.S. Randhawa in his booklet "Green Revolution in Punjab", published by the Punjab Agricultural University Ludhiana in 1984, has mentioned some such decisions which helped the success of the green revolution in that state in a big way. For example

- (i) To work the new tubewells, threshers, pumpsets and chaff-cutters, rural electrification was a must. Having created the demand, power had to be supplied. When power was available, its use had to be further popularised in the interest of production. In 1978, the state government decided to charge flat rates for electricity used by the private tubewells. The canals irrigated nearly 13.8 lakh ha then and the farmers' tubewells irrigated 18.1 lakh ha. With the latter the cropping intensity could even be raised to 200 per cent. To promote the electrification of tubewells, a flat rate system for electricity charges was decided upon. This removed uncertainty from the minds of the farmers who now knew what they had to pay for certain. Without this incentive-oriented system, rice cultivation in Punjab would not have picked up; nor later on in Haryana. The power Boards complained about losses in their budgets but the state's economy on the whole gained. Dr. Randhawa suggests "We have a tendency to look at the economics of various sectors in isolation from each other. What does it matter if one sector loses, but the economy as a whole gains much more? If stagnant areas in Bihar, UP, Assam, Orissa and West Bengal are to be activated, the State Governments concerned should adopt flat rate system for electrified tubewells".¹

(A similar logic must have inspired the then Haryana chief minister when he decided to go in for those expensive, "technically" non-profitable lift irrigation schemes in the 70s.)

- (ii) The failure of the monsoons in 1965-66, and again in 1968, provided a great stimulus to the tapping of ground water—a blessing in disguise since hyv seeds required large quantities of water which only tubewells could supply with regularity. This water came handy even in canal-irrigated areas where irrigation intensity was low. Sinking of tubewells was easy as the holdings had already been consolidated.
- (iii) With the arrival of mexican wheat seed varieties in the Punjab, its agronomists standardised the cultural practices to enable the new varieties to reach their full yield potential. This led to the use of seed-cum-fertiliser drills for proper placement of seed and fertilisers, as well as harvesting and threshing machinery. The farmers for the first time learnt the use of fertilisers and agricultural machinery on a large scale. What they learnt to use for wheat, they applied to other crops also.

- (iv) Need for farm mechanisation (in the context of Punjab conditions); it was necessary to do so for intensive cropping, to save time for sowing of the next crop. Mechanisation also helped greatly in the utilisation of scarce resources, including land. It did not dislocate the local labour either. In fact the new agricultural technology, coupled with multiple cropping, generated a lot of demand for labour. In result, Punjab imports a lot of labour from UP, Bihar and Rajasthan now.
- (v) *Rural Link Roads* : Punjab gave a lead in providing link roads to villages in 1968. Increased production of wheat in the state, as a result of the new technology, led to the imperative necessity of having link roads to market towns for disposal of the surplus. Out of 12,188 villages, nearly 12,000 had been connected by pucca roads. This stirred up the entire countryside and helped in the dissemination of the green revolution technology. The major credit for this crash programme went to the then chief minister Punjab, now the President of India. He took personal interest in making the progress a success. Good production needs good roads, for proper marketing of the crop.
- (vi) The Punjab built up its Agricultural University at Ludhiana in the sixties with great interest and hopes. It did a remarkable job of work within a few years and made an impact on the attitude of the farmers through its services which included meaningful agricultural education, scientific research and extension network which provided a close link with the farmers down in the field. The Directorate of Extension Education would test the research findings approved by the Research Evaluation Committee at the farmers fields before these were incorporated in the package of practices, to be published in a book form annually for the two crops, after jointly considering the latest research findings of the University and the feedback of the experience of the extension staff of the agriculture department.
 The agriculture extension work in the state, done jointly by the PAU extension staff and staff of the state agriculture department, was successful in leading to a rapid transfer and adoption of the latest production technology in minimum time. A model to follow; PAU is the pivot of green revolution in the Punjab.
- (vii) Progress in Punjab compared with that in Punjab (Pakistan) :—
 "The new hyv seeds were made available to both Punjab's alike in the sixties. The two countries enjoyed the same opportunities and faced the same problems in the procurement of fertilisers. The wide disparity in achievement emphasises the importance of those other factors of social structure that have, infact, been so significant for the success of cultural development. The agricultural growth rate of Indian Punjab from 1952-53 to 1969-70 has been 6.6 per cent and that of India 3.1 per cent (Commerce, 1972). According to NULTY, that of Pakistan Punjab over 1959-60 to 1969-70 has been barely 2.0 per cent. One can make many guesses of the reasons for the decline of the colonies of the west and the rise of the poorer eastern half. The mal-distribution of land in West Punjab, the

predominance of tenancies, the lack of an institutional credit system/structure able to serve the majority of the medium and small farmers, the failure to complete the consolidation of land holdings and the inadequacy of literacy and the road system—two main carriers of all progress—explain why West Punjab lagged behind East Punjab”.²

(viii) Factors which have contributed to the success of Green Revolution in Punjab and Haryana can be summed up below :—

- (a) The role of the human element and the organisational structure.
- (b) A rational policy of land reforms.
- (c) Consolidation of holdings as the ‘sine qua non’ of agricultural development; it leads to national land use and effective use of ground water resources with the aid of tubewells.
- (d) Development of irrigation—minor irrigation having precedence over major and medium schemes—including optimum utilisation of ground water;
- (e) Rural electrification for a greater use of energy in agriculture which is a must;
- (f) Rural link roads linking villages with market towns;
- (g) An agricultural university controlling the entire research and education in agriculture and related sciences and also doing a good bit of extension work by providing technical support to extension agencies;
- (h) Building up of efficient departments of agriculture and animal husbandry in the state. Similarly a strong cooperative department to provide credit, including credit in kind under a crop loan system to farmers to promote the use of fertilisers and other essential inputs.
- (i) A well organised marketing system apexed by a marketing federation whose function should be to supply inputs to and to purchase food-grains from farmers. In fact, credit should be linked with marketing through cooperative channels.
- (j) Autonomous corporations for agro-industries, dairy and poultry development; they function more efficiently and with less red tape.
- (k) Supply of tractors for intensive agriculture to save time, making double cropping a possibility.
- (l) A remunerative price for the farmer backed by a price support policy, through APC and FCI types of organisations.

Need for Simplification of Working Procedures

Now we can briefly and illustratively deal with our working procedures. However much we may abhor the play-safe procedures which we have inherited from the colonial system of administration, meant to cater for law and order and revenue collection requirements, it can be safely stated that an abrupt cent per cent change in that system seems out of the question—and it has not taken place all these more than three decades—but, overtime, some improvements have been made in the system

as a result of conscious decisions taken in pursuance of recommendations of Administrative Reforms Commission/Committees. In day-to-day working, a lot depends on the bureaucratic boss, supported by the political head and many simplifications and time-saving devices can be introduced without much opposition. Some suggestions made in the succeeding paragraphs, by way of illustration, can come handy in many situations and can be tried by the state governments with advantage.

- (i) That the Finance Department acts as a great deterrent to activity and even obstructs progress in many ways, goes without contradiction, except by those who man that department. Finance people, holding no responsibility for producing results on the ground, adopt their hindering tactics by sheer force of habit and colonial convention. Needless to say that all ways and means should be found to simplify their role to the maximum—facetiously put, to clip their wings in the interest of progress. It would be absurd, for example, to allow the finance ministry etc. question or interfere with the implementation of a project or scheme, if it has found a place in the Budget which has been passed by the elected House of Legislature. The late Partap Singh Kairon had set up a committee, headed by the chief secretary, to advise on simplifying the procedures adopted by the finance department. Many good suggestions were made and suitable amendments made in the financial rules and regulations.

There would be a need for flexibility in budgetary allocations for agriculture and transfers permitted without much fuss. Some free funds may also be provided, available for use in specific areas for unforeseen purposes, to be justified later. This would be all the more necessary when decentralisation of planning and implementation of agricultural development programme takes place at the district or block level.

- (ii) System of noting by different grades, vertically and horizontally, should be eliminated, it is wasteful of time and energy serving no useful purpose. Preferably, decisions should be taken in important matters across the table in a discussion after which a brief record may be kept of the points made and the decisions taken. The usual resort to 'W' process (in which noting starts from the dealing assistant in the department, goes upto the head of department after three or four intermediaries; after OK it is sent to the administrative secretary in a self contained reference and there the dealing assistant comes into the picture again, repeating the performance at so many familiar levels and so on to the planning and finance departments till the scheme is sanctioned finally, (even though it was only a continuing plan scheme) will need to be abandoned. The whole exercise could have been done in one go if the development commissioner had held discussions with all concerned and finalised the year's agricultural plan, all in a few days, and recorded the net decisions for action by all concerned.

The present procedures are generally "cumbersome, wasteful and dilatory" (Paul H. Appleby, 1954) even today.

- (iii) There is a dire need for coordination between agriculture and allied sector departments. APC could do this by definition provided he enjoys a status higher than that of administrative secretaries. Similarly at the district level, the DM/Collector could do it.
- (iv) Field cadres should be carefully selected and specially trained as suggested in the Chapter on Development Bureaucracy. The heads of field organisations would need to be allowed to continue for at least three, if not four years in the same job. Promotion, if and when due, may be given in situ.
- (v) Local decision-making should be encouraged. In fact, "innovative management" should be encouraged in preference to conventional administration. A conscious effort would need to be made in that direction.
- (vi) It is better management at the state, district and block level which can do more for progressive improvement of agricultural productivity than anything else.

NOTES

1. Dr. M.S. Randhawa, "Green Revolution in Punjab"—PAU 1984, p. 14.
2. Gill, M.S. "The Green Revolution—Success in the Indian Punjab"—Paper presented at the Centenary Celebrations of Birmingham University 1975.

Special Dispensation for Small and Marginal Farmers

As Table 37 below in three parts will show, even though there was a small decline in the concentration of land, after land reforms legislation in the 50's, land distribution in the country remained highly skewed. In fact, the distortion had increased by 1970-71. Whereas, in 1960-61, bottom 62 per cent of the holdings operated 19 per cent of the area, in 1970-71, the bottom 51 per cent operated only 9 per cent. Similarly whereas top 5 per cent of holdings were operating 29 per cent of the area in 1960-61, by 1970-71 top 4 per cent were operating 31 per cent of the area.

Part (c) of the Table shows that small and marginal farmers (up to 3 hectares or 7.5 acres of land) are predominant in UP and Bihar. These two states have 1/3 of the total operational holdings in the country, with a total area of only 17 per cent. Whereas average holding in the country is 2 ha, in UP the average is 1.05 ha and in Bihar 1.11 ha. These are almost the lowest, barring in Kerala and West Bengal.

This skewed pattern of land holdings creates grave complications. The small holders cannot produce enough even for the subsistence of their own families and they are net buyers of food in the year. On the other hand, big land-holders (above 3 ha) throw up a big marketed surplus of foodgrains (as happened in 1984 and 1985) which would give the impression that the country had become highly surplus in food. How could that be when such a big chunk of our population lived below the poverty line¹, not able to afford adequate calories for themselves and their families? And Bihar and UP states are full of such people, their per capita income is the lowest in the country; their per capita rate of progress is at the bottom. Economists have rightly felt that if this unsavoury phenomenon of coexistence of surplus food and starvation is to be avoided, public policy must ensure that the share of the small and marginal farmers in land ownership/operations, and in production growth is raised substantially".²

As we have seen above in the Chapter on Land Reforms, land redistribution has

TABLE 37A

**All India Size Distribution of Operational Agricultural Holdings
Number of Holdings and Area Operated**

Size (Acres)	1953-54		1960-61		Size in ha	1970-71	
	% of total holdings	% of area operated	% of total holdings	% of area operated		% of total holdings	% of area operated
Very small upto 0.99	19.7	1.1	17.1	1.3	Marginal less than 1 ha	50.6	9.0
Small 1.00-4.99	40.3	14.4	44.6	17.9	Small 1-2 ha	19.0	11.9
Medium 5.00 to 14.99	27.5	31.2	27.8	34.9	Semi Medium 2-4 ha	15.2	18.5
Medium large 15.00-24.99	6.7	16.8	6.0	17.0	Medium 4-10 ha	11.3	29.7
Large 25.00-49.99	4.3	19.6	3.5	17.4	Large 10 and above	3.9	30.7
Very large 50.00 and above	1.5	17.0	1.0	11.6	Total	100.00	100.00
Total	100.00	100.00	100.00	100.00			

Source :— Government of India National Sample Survey 8th and 17th rounds.

Source :—Government of India Ministry on Agri. and Irrigation, All India Report on Agriculture Census 1970-71.

TABLE 37B
All India Size Distribution of Operational Agricultural Holdings, Statewise
Number of Holdings and Area Operated

State	Number and area of operational holdings 1976-77				
	Number of holdings		Area operated		Average size of holdings (ha)
	'000 ha	%	'000 ha	%	
AP	6,154	7.6	14,390	8.8	2.34
Assam	2,254	3.8	3,079	1.9	1.37
Bihar	9,936	12.2	11,073	6.8	1.11
Gujarat	2,713	3.3	10,075	6.2	3.77
Haryana	999	1.2	3,779	2.2	3.58
Karnataka	3,811	4.7	11,357	7.0	2.98
Kerala	3,501	4.3	1,719	1.1	0.49
MP	6,061	7.4	21,691	13.3	3.58
Maharashtra	5,764	7.1	21,105	12.9	3.68
Orissa	3,590	4.4	5,751	3.5	1.60
Punjab	1,504	1.8	4,125	2.5	2.74
Rajasthan	4,366	5.3	20,301	12.4	4.65
TN	6,111	7.5	7,629	4.7	1.25
UP	16,971	20.8	17,861	10.9	1.05
W. Bengal	5,267	6.5	5,221	3.2	0.99
Union Territories	283	0.3	719	0.4	2.54
Total	81,569	10.0	1,63,345	10.0	2.00

Source :— Indian Agriculture in Brief, 19th Edition 1982.

TABLE 37C

**All India Size Distribution of Operational Agricultural Holdings,
Number of Holdings and Area Operated**

<i>1960-61—Details of Holdings by size and area</i>				
<i>Size area</i>	<i>Estimate number of holdings (‘000)</i>	<i>%</i>	<i>Estimated area operated (‘000 acres)</i>	<i>%</i>
up to 0.49	4,341	8.55	1,053	0.32
0.50- 0.99	4,345	8.58	3,146	0.95
1.0 - 2.49	11,140	21.94	18,433	5.59
2.50- 4.49	11,484	22.62	40,616	12.32
5.0 - 7.49	6,517	12.84	38,661	11.73
7.50- 9.99	3,532	6.96	29,557	8.97
10.0 -12.49	2,565	5.05	27,191	8.25
12.50-14.99	1,474	2.90	19,595	5.95
15.0 -19.99	1,902	3.75	31,564	9.58
20.0 -24.99	1,162	2.29	24,352	7.39
25.0 -29.99	664	1.31	17,468	5.38
30.0 -49.99	1,108	2.18	39,710	12.05
50.00 and above	521	1.03	38,229	11.60
All Sizes	50,765	100.00	329,585	100.00
Average Size	=	6.49 Acres		

Sources :— India, 1968, p. 163.

not succeeded in remedying this situation so far. In fact ceiling laws have been flouted or not enforced wilfully. The only other alternative to save these people at the bottom rung of our economy is to concentrate maximum public and private effort to improve the production and productivity of small farms through target application of approved technology, extension services, adequate credit, input supply and correlated infrastructure. It is, in fact, very necessary to widen their base of production by enabling these small and marginal farmers to apply modern technology to their holdings, however small, and in a big way. They should be assisted to increase their share in production and productivity, in short.

Even under the National Food Security concept, as propounded by the Director General of FAO recently, all people in a country should have *both physical and economic access to the basic food they need*. Economic access would imply removal of poverty—but how? There is thus a close link between food supply, poverty and agricultural productivity in third world agricultural countries. Key to eradication of poverty and malnutrition in countries like India would lie is faster growth and productivity in agriculture generally, with special attention paid to the interest of small and marginal farmers in that direction particularly.

“In short, smaller farms were found to be more efficient in terms of production from a unit of land but less efficient than their larger counterparts in terms of returns on capital, labour productivity and marketed surplus. As long as land remained the binding constraint in Indian agriculture there was everything to be said in terms of efficiency in favour of small farm holdings. But if the policy was to maximise surplus, to make the best possible use of available capital or labour efficiency, the verdict would have gone in favour of larger holdings”.³

Empirical studies in the 60's had shown that small farms did not affect agricultural efficiency; in fact, these had made bigger contribution in production per unit of land than the larger holdings. Even with the coming in of the hyv seeds/ Green Revolution, the new technology was found to be 'scale neutral', assuming tube well water and machinery could be shared with the neighbour on "using time" basis. Unfortunately it was not 'resource neutral' because credit was in any case required by all sized holdings as all inputs like fertilizers, seed, pesticides etc had to be purchased in the market. And the source of that credit—apart from the usurious 'bania'—were the government/cooperatives/banks, but the latter agencies could not deliver the goods to the small and marginal farmers as a target group.

Towards the late 60s and early 70s, the Government of India sponsored two special programmes with the object of giving institutional support to the small and marginal farmers and agricultural labourers—called SFDA (Small Farmers Development Agency) and MFAL (Marginal Farmers and Agricultural Labourers). SFDA was started on the report of the All India Rural Credit Review Committee 1969, expressing dissatisfaction with the lack of access of small farmers to institutional credit. It had noted that

“...small cultivators are denied credit even when the amount is within their

repaying capacity. A variety of factors account for this. The most important of these is the traditionally conservative approach of the influential and better off sections of cultivators who dominate the cooperatives and run it as a closed shop. Prejudice and indifference towards the small man—sometimes based on caste or other sociological factors—also account for this attitude of exclusiveness. The reluctance to finance the small cultivator is sometimes based on a genuine apprehension that he lacks repaying capacity or that his tenurial status is inferior or undefined or informal or that the security offered is inadequate and unrealisable. However baseless the apprehensions may be, they have to be reckoned with and overcome".⁴

The task of the SFDA was to identify the problems of small farmers in the district and then to prepare programme for helping them secure the provision of various services and inputs, arrange small irrigation, introduction of hyv seeds, flow of credit from banks and cooperatives. The Fourth Five Year Plan provided for 46 pilot projects under SFDA covering 50,000 small farmers each, a registered society outside the usual administrative set up to avoid rules and procedures, getting a direct grant from the national budget, with a committee presided over by the D.M. to direct the operations etc. Small farmers were eligible for a 25 per cent subsidy on loans received from banks and the latter were subsidised for administering such loans.

MFAL was started in 1969-70 with 41 projects, not at district level but at the subdivisional/block level, each covering 20,000 people holding below 1 ha of land. The project covered non-farm activities, improved agricultural practices, minor irrigation and horticulture etc. For agricultural labourers (AL) it included rural works programmes, homestead land and assistance for building houses etc.

For both schemes Rs. 115 crores were provided in the Fourth Plan—but not even half the amount could be spent. Fifth Plan earmarked Rs. 200 crores covering 160 districts, combining both the schemes in the same areas, in addition to what was provided under the Drought Prone Areas Programme (DPAP) and Command Area Development Programme (CADP) in major and medium irrigation areas, and so on.

The effect of SFDA was limited in many ways. Its coverage was not adequate. Its activities were strictly confined to providing subsidy and risk coverage to banks and cooperatives advancing loans to small farmers. Its staff was small, even working part-time for the scheme. The actual job was performed by the existing institutions, dominated by the richer sections of society. Actual disbursement of loans was short of sanctioned amounts and the targets were seldom achieved. In short, the scheme was shoddily projected and half heartedly implemented. No special effort was made towards its success.

The fate of the MFAL was also similar. Physical targets remained unfulfilled and most benefits went to large farmers, able to manipulate the bureaucracy. The programme was launched without proper planning and provision of credit and inputs. "It failed because it was set up without first undertaking thorough changes in the local and political environment. . . The experiences of both SFDA and MFAL show that it is not enough to set up an organisation catering for a target group without first undertaking those changes. As long as village society remains stratified and

dominated by the richer component, it is difficult to implement measures which solely cater for the needs of the under-privileged".⁵

The present writer does not agree with the above conclusion. If a project is properly planned with all details worked out, and then properly administered, there is no reason why it should fail. Of course, the political will is required for its success, along with the efforts of a determined and devoted bureaucracy. Both are so closely linked. Half-hearted measures seldom succeed especially when adopted by a government agency. It is easier to say that we should first undertake thorough changes in the local and political environment, but how? The quickest way is to embark on projects like SFDA, MFAL with full preparation and thorough planning and ensuring their success with a competent administrative effort in the field. Things do not and cannot happen on their own, nor half-heartedly, in a backward economy. It is, inter alia, in such projects that the softness or hardness of an administrative machine is put to a real test. It does not help much if such good schemes are abandoned or replaced by new ones which are also implemented equally 'softly'.

These schemes—or at least their objectives—were incorporated in the Twenty Point Programme initiated by the late Mrs. Indira Gandhi during the Emergency days. Some progress was made in the right direction for sometime.

The Integrated Rural Development Programme (IRDP) was launched in 1978-79 in 2300 Development Blocks which were earlier covered by special programmes including SFDA, MFAL, CADP and DPAP. All blocks were covered by it in October 1980. It took the shape of poverty alleviation programme, the objective being to provide assistance to families below the poverty line and to improve their income levels. The capital cost of productive assets is subsidised up to 25 per cent for small farmers, 33½ per cent for marginal farmers, agricultural labourers and rural artisans and 50 per cent for scheduled tribes. The limit of subsidy for a family is Rs. 3000/-, 4000/- and 5000/- for ordinary, DPAP and scheduled tribe cases respectively. The balance cost of assets is provided as credit by the banking institutions. Sixth Plan provided for a subsidy of Rs. 1500 crores (shared equally by the centre and states) and Rs. 3,000/- crores as credit. The programme is being implemented through district rural development agencies and blocks. The representatives of the people including MPs and MLA, zila parishad and panchayat samities are intimately involved in the planning and implementation of the programme.

The Department of Rural Development, Government of India, claims the success of IRDP in the following terms :

"While the quantitative parameters show satisfactory and healthy trends, every effort has been made to emphasize qualitative aspects also. The final impact of such investment in terms of self-employment, incremental incomes and consumption can however be estimated only after a lapse of some time".⁶

A report on its working by NABARD is encouraging. It claims that 47 per cent of the beneficiaries were helped by it to cross the poverty line. But reading

these reports between the lines it becomes clear that the mobilisation of credit for the small and marginal farmers has not taken place adequately and a specific project of helping them in the shape of SFDA/MFAL has been sidetracked into a general programme of poverty removal. It would be advisable to revive these schemes for this target group of small and marginal farmers, with a view to prominently influencing the agricultural economy of eastern UP and Bihar. Needless to add that any other programmes like IRDP, NREP, RLEGP, DPAP etc will still help these categories in a general way, not necessarily in the augmentation of agricultural production only. The success of such useful schemes can be ensured only by a meticulous implementation there of an implementation carried out 'hardly' and not 'softly'.

NOTES

1. Below poverty line (rural and urban combined) figures : All India 48.13 per cent; Bihar 57.49 per cent, UP 50.09 per cent, Punjab 15.13 per cent, Haryana 24.84 per cent, Orissa 66.40 per cent, MP 57.73 per cent.
2. M.L. Dantwala *ibid*.
3. Biplab Das Gupta. "The New Agrarian Technology and India" UNRI/Macmillan India 1977/1980; P. 179.
4. Report of the All India Rural Credit Review Committee Reserve Bank of India, New Delhi, 1969.
5. Biplab Das Gupta : The New Agrarian Technology and India UNRI/Macmillan India 1977/1980, PP. 312-13.
6. Annual Report of the Deptt. of Rural Development, Govt. of India, 1984-85, P. 11.

Some Subjects (Illustrative) for Planning

Low level of agricultural growth in states like UP (eastern) and Bihar has been due to a limited resource-base of its lower-rung farmers and an inadequacy of supply services and infrastructural support given to them by the state, due mainly to low levels of administrative efficiency. The biggest sufferers in this neglect have been the small and marginal farmers. Modern agricultural technology being 'size neutral', the smallness of the holding is not all that big a constraint in the way of progress and income. Kerala is a high productivity state in India even though the farm size is very small. Experience of Japan and Taiwan also supports it. A one ha farm can give sufficient net income with the use of appropriate technology, including capital and inputs provided by private and public institutions in accordance with an overall plan.

Planning for agricultural development under the new technology will have to be in detail, taking all aspects of the subject into account. Obviously, priority would go to those aspects where some progress, an opening as it were, has already been made in a region or area. Some areas and regions which have some particular advantages of local resources—or those which have some peculiar constraints—will have to be tackled differently, bearing those advantages and constraints in mind. Among the long range benefit and short range benefit-yielding schemes/projects, priority will naturally go to the latter, if funds be limited. The needs to augment production and productivity will never be lost sight of. Things like ground water exploitation will have priority over medium/major irrigation schemes. Consolidation of holdings will get top priority, being a long gestation exercise but, all same, most vital to the programme. These points are only by way of illustration. The planning, in all its aspects, will have to be done at the level of the CAPD (Development Commissioner) sitting in a meeting with the concerned heads of departments and their senior field officers. When only a broad framework of plans is drawn

up in respect of some matters, details may be left to the lower levels but overall coordination must be done by the CAPD himself. A personalised interest and attention to the programme would be absolutely necessary so that planning is comprehensive and no wastage is involved.

Some subjects and points for agricultural planning are being suggested below merely as a guide to the planners. The list is not exhaustive but only illustrative ; use has also been made here of the Report of the "Committee on Agricultural Productivity in Eastern India", recently published by the RBI (1985) and referred in Chapter 9 already. Their implementation is more important than the content :

A. (i) Land/Farm Policy and Management

1. *Consolidation of fragmented holdings.* High priority to be given to irrigated areas and those with ground water potential. Rights of tenants and share croppers to be recorded properly and secured in the consolidation process.
2. Small holders of one ha and below may be freely allowed to lease in and out, to make holdings more economic, with provision to get back their land for self-cultivation.
3. Operational holdings may be subjected to a floor limit of say one ha, for reasons of productivity. Laws may be suitably amended.
4. Farmers of small holdings may be persuaded to form groups for joint operations on a cooperative basis—operations like sharing of tubewell irrigation, machinery, transport and micro water-shed management etc.
5. (ii) *Crop Planning* to be done separately for canal and tubewell irrigated areas, flood areas and dry farm areas. Lands not suitable for rice growing should be sown with low duty crops requiring less water.
6. In canal irrigated areas, command area development should take place on priority. Poor and marginal lands may be used for growing millets and fodder crops.
7. The cropping pattern will vary from region to region, depending on factors like soil, climatic conditions and water availability. For example horticulture and agroforestry will be preferable for hilly areas.
- iii) *Special attention to Small and Marginal Farmers*
8. High value crops to be raised with hyv seeds in areas with irrigation and market accessibility. They may be helped in the process by provision of minikits of seeds and fertilizers along with extension support : multiple cropping to be encouraged ; increase in productivity to be obtained through careful land preparation, weeding, good water management, hyv seeds, scientific fertilisation and plant protection measures.
9. Special attention to be paid to streamline the systems for input supply, output marketing and credit flows.
10. Mixed farming is a 'must' for small and marginal farmers if they do not have regular irrigation water supplies ; drought resistant varieties of crops to be preferred requiring less water.

11. Necessary infrastructural support will have to be arranged by the state governments in a planned manner, on priority for this category of farmers as a target group.
12. Improved but less expensive implements to be introduced among this category of farmers. Their manufacture to be encouraged locally through private sector or Agro-Industries Corporations. Costly machinery and implements to be supplied through Agro-Service Centres on custom basis—to be set up by the department of agriculture, or cooperative societies to be organised for the purpose. Even private leasing agencies can be set up for hiring out to farmers on prescribed rates.
13. A healthy competition between these three types of sources should be promoted as a policy. Agro-service centres to be set up similarly on a non-monopoly basis.
14. Farmers of this category should concentrate on the optimum use of land and labour for improving productivity both per ha and per capita.
15. All inputs, supplies and services as well as credit will need to be arranged in time and adequately and at reasonable rates.
- 15-A. As said earlier, schemes like SFDA and MFAL should be reintroduced.

B. Irrigation and Water Management

(i) *Ground Water Exploitation*

16. Large untapped ground water resources in Bihar and UP to be exploited fully in a planned manner—to provide controlled irrigation. To be done in full consultation with the Central Ground Water Board who have a lot of useful data available with them.
17. Data may be prepared block-wise and updated where necessary. An over-all fresh assessment of ground water may be made, taking into account the recharge rate. Rather than boring tubewells haphazardly, it will be better to concentrate effort, in selected areas with adequate potential so that quick benefits could be realised with proper follow up steps. Productivity will improve per ha and per capita.
18. State governments may instal their own tubewells, to supply water for irrigation to small farmers, apart from encouraging private farmers with loans and credit. Rural electrification will have to keep pace with this programme. Where that be not possible, diesel pumpsets may be installed in the meantime even though the initial cost be higher.

(ii) *Water Management and Drainage*

19. Apart from tubewells, shallow and deep, each block may be equipped with a number of light diesel pumps which could be used, where required, for lifting irrigation water from rivers, canals, tanks and wells, or for draining out water-logged areas.

20. Canal irrigation channels should be improved with adequate provision for control structures and regulated release of water. Well laid out field channels and drains will have to be constructed in the farms in a planned manner—the former to spread irrigation uniformly and the latter to remove surplus water.
21. The existing functioning of the state deep tubewells should be improved; more should be installed carefully. The financial viability of running these tubewells be the State Corporations concerned should be sorted out. Preferably, whereas their installation and channel-making may be done by the government, the management thereof may be entrusted to the beneficiary farmers groups/associations.

(iii) *Canal Irrigation*

22. Old canal systems may be modified so as to provide full irrigation to the command areas; in other words, they should be converted from protective to productive irrigation in compact command areas. If possible, ground water tubewells may be installed in these areas, for augmentation and control of water supplies.
23. Release of canal water should be regulated suitably. Supplies should be made in May and June also, by dispersing the closure period—as done by the UP government already, in the interest of kharif sowings.
24. There is a dire need of proper coordination between the command area authority and the senior agricultural officer, for closure of canals and release of irrigation water for crops decided appropriately. Progressive application of “warabandi” (rotational water supply) should be applied to the command area farmers. Farmers’ group leaders should be associated for working out details. Field channels may be made and properly maintained, so as to make best use of canal water. Drainage channels should also be constructed where necessary. To make no exceptions among farmers to doing so, suitable legislative powers may be adopted by the department.
25. Water rates, too low at present, should be gradually raised to economic levels, in a manner so as to economise the use of water in the shape of over irrigation.
26. Measures for conjunctive use of canal and ground water for crops, along with rain water, should be encouraged. This could be done with advantage in the command areas of major and medium irrigation projects, through ‘sinking’ of tubewells and enforcing the ‘warabandi’ system.
27. River lift irrigation projects may be surveyed and encouraged for protective irrigation in kharif, where possible, especially in the drought prone areas;
28. Sprinkler irrigation will be useful for steep and undulating terrain where water may be scarce. It saves water and obviates land levelling.
29. Natural drainage has been disturbed by the construction of public utilities like roads, railways and canals etc. Excess monsoon water, not draining

out properly, water logs huge cultivable areas thus damaging the crops. There is need for adequate cross drainage to help natural flow of water. Coordinated effort is needed in this behalf. Recommendations of the National Flood Commission may be seen. A master plan for drainage should be prepared by the state governments comprehensively and implemented according to a programme.

30. Field drains will be constructed by the farmers as part of the OFD works under the CADA.
31. Flood control works to receive priority in Bihar and Eastern UP-work-like embankments, channel improvements, afforestation, storage reservoirs and drainage. Coordination with neighbouring states will be required.

C. Supply of Inputs

32. Retail outlets for the sale of hyv seeds, fertilisers and pesticides should be opened in the rural areas beyond the block headquarters so that the small and marginal farmers can afford to get them in time and without spending on transport. Demand and supply of these essential items should be properly planned and monitored by the agriculture department. Block level calculations should be made. Entire area should be saturated with hyv seeds in minimum time. This will be the beginning of the Green Revolution.
33. The breeder seeds, foundation seeds and certified seeds sequence should be properly worked out and observed. Agricultural universities will play their part in it. The existing production capacity of state seed farms and corporations to produce certified seeds may have to be raised, including through the agency of private registered growers and contract farmers. Where seed is to be imported from other states, advance arrangements should be made for it, to ensure quality and timely supplies (to obviate eleventh hour reliance on the FCI supplies of wheat).
34. As in the case of hyv seeds, the supply of fertilisers should also be arranged for the interior villages away from the block headquarters. If the cooperative stores do not perform well for lack of funds or otherwise, alternate depots should be opened. It will be safer to introduce crop-loan system in kind-even for small and marginal farmers. If a 50 kg bag of fertilisers is too big for some of the latter category of farmers, 20 kg bags should be introduced. Arrangements for soil-testing should be improved and popularised, to get the best out of chemical fertilisers. Attention be paid to the supply and application of micro nutrients in some soils.
35. Timely detection of pests and diseases of plants should be organised by surveillance and proper application of pesticides ensured. There should be a proper check on their quality and prices.
36. Extension agencies will ensure that farmers are properly educated in and trained for the use of non-monetary inputs for rice cultivation—regarding rearing up of nurseries, methods of transplanting, application of water, fertilisers, sprays and insecticides and weed control etc.

D. Research, Training and Extension

37. Full use should be made of agricultural universities in the state for basic and applied research. Local "problem specific" research by scientists will yield better results and be of benefit to the farmer. Agricultural universities must keep upto date with world research in various fields like biological nitrogen fixation, photosynthesis, fertiliser application at the roots, nutrient absorption, tillage economy, water management, problems of multiple and inter cropping etc.
38. The departments of agriculture should create adequate facilities for adaptive research, locating centres in keeping with agroclimatic conditions. In this connection, it should be ensured that even the ICAR centres located in the states take adequate interest in regional problems and find solutions thereto.
39. In keeping with local conditions, problems and variations, the research scientists must go into the differential of productivity between kharif and rabi rice crops even though the same rice is sown on the same land in quick succession.
40. During kharif sowings, if monsoon is heavy, the efficiency use of fertilisers gets reduced. As a result less fertiliser is being consumed in this major crop season by the farmer. This adversely affects productivity. Research must attend to this problem of rice cultivation.
41. Full application of T & V (Training and Visit) System is necessary. It should be extended to eastern UP and Bihar. The system is based on the assumption that the VLW is meant exclusively for agricultural extension work under a single line of command. There are many subject-matter specialists in the block to guide him. But there is still a strong need for proper linkage between the input and credit delivery system and extension agency, to realise full benefit from the new technology.
42. As a part of extension work, small/marginal farmers should be encouraged to take up mixed farming and cultivation of high value crops in a part of their holdings.
43. Mass media should be more effectively utilised for agricultural extension work.

E. Marketing and Transport

44. Marketing outlets are absolutely necessary for encouraging production. Demand constraints must not be allowed to interfere with it. Procurement arrangements should be made in time. Price support measures should not be allowed to fail. The present marketing structure in Bihar and UP would need to be improved. Regulation of markets has been slow. Cooperative marketing has made little impact there. Private trader rules the roost.
45. All markets, wholesale, assembling and rural, should be brought under the

Agricultural Produce Markets Act. Regulated markets should be constructed and developed in a planned way. Market committees should be organised there, with representatives from trade, producers and small farming class. Adequate facilities should be provided for grading, cleaning, weighing and storage etc.

46. Each state should have a full fledged directorate of agricultural marketing to enforce laws, make surveys, research and coordination with government department with a view to planning and development of markets.
47. There is need to improve the rural road net-work, from district headquarters to rural areas. All villages need to be connected through link roads to nearest motorable roads. Access to market points is particularly important through motorable roads. Rural transport, properly organised, can offer a good deal of employment in the secondary sector, to rural youth.

F. Credit Needs

48. The major thrust of credit policy should be to provide adequate and timely credit to farmers, especially in the small and marginal category and to share croppers. Cooperative credit societies will have to be strengthened, their overdue position improved and the entire effort supplemented by commercial banks and RRBs. Any credit policy will need to take into account the credit-absorption capacity of the farmers of a region and make gradual disbursement of credit to them to create an impact on production. Weaker section will need special dispensation and attention.
49. Short term production credit should include, in addition to cost of inputs, labour, irrigation, charges for hiring machinery etc and some consumption expenditure also. It should be adequate and timely. Cash component should be confined to cost of labour and consumption expenditure. The rest should be in kind as far as possible. For credit in kind, the farmer should not be tied down to a single supplier but to a list of selected dealers approved by the government and the banks. Due date for payment should be fixed—within one month of marketing of the crop. Charging of penal interest thereafter should be only gradual. "Genuine difficulty" categories will have to be elaborated, to cover unforeseen calamities.
50. Every farmer should know about his credit entitlement which the Primary Agricultural Societies (PACs) should prepare—in respect of short term and medium term loans.
51. Medium and long term loans may be made available to farmers individually or in groups after a careful assessment of needs on the basis of prescribed norms—avoiding over and under financing. In the case of loans for tube-wells, the minimum size of the holdings should not be insisted upon—the loanee can sell surplus water to the neighbouring farmers.
52. Loanees should be educated about their obligations and dates of payment by issue of passbooks indicating, interalia, their assets and loan transactions

from credit institutions. It should be ensured that loans are used for the purpose for which these are given. The primary cooperative societies will report defaulting cases to central cooperative banks/bank managers etc.

53. Steps should be taken to get the overdues cleared in the cooperative sector. Cases of wilful default should be dealt with more strictly than those of non-wilful default. Special drive for recoveries may be launched during the recovery season (post harvest) by the cooperatives and land development bank agencies/collectors. Recoveries, where possible, may be linked with procurement under suitable arrangement with the agencies concerned.
54. Rural credit policy procedures should be simplified by RBI and NABARD.

G. Dry Land Farming

55. Of the total 142 mha of cultivated land in the country about 100 mha are dry lands (only rainfed) on which 550 m. people depend for their living. These lands account for 2/3 of the total production.
56. The dry land soils are generally inferior in quality compared to irrigated lands. If they have heavy rainfall, it is concentrated in 2-3 months of the year. Generally the poorer sections of the farming community live on these drylands. The holdings are small and scattered and their soils are poor, shallow and even hungry. In spite of all these handicaps, today 2/3 of rice, 1/3 wheat and all our coarsegrains and 75 percent of pulses/oilseeds in the country are grown on these dry areas—all depending on the monsoons, without any scientific aid to exploit the potential of rainfed lands. Even if we complete all our major/medium irrigation projects by 2000 AD, about 45 per cent of our cultivable land will still be rainfed. Our stake in dry land farming will thus be very high, even when we are able to use our irrigated lands to the maximum for boosting production.
57. To make optimum use of these lands we need specific technologies, management practices and cropping patterns, to suit all types of dry lands with even very low rainfall. Fortunately these have been developed by the ICAR and field experiments have been found very promising. Since the farmers owning these lands are mostly small and marginal ones, the state administrations will have to make special efforts to see that these farmers get full advantage of the new techniques and patterns and the wherewithal required for the same.
58. Improved production programmes in drylands will need to be based on lands that have already been treated with the known soil and water conservation structures. The most important components in the improved dry-land farming are proper tillage, early sowing, choice of suitable crops and varieties, optimum plant population, timely weeding and pest control and moderate use of fertilisers.

The primary resources at farm level being land and rainfall various measures have to be adopted to use optimally these two resources for improving the crop production. With better rain and better moisture

storage capacity, cropping intensity can be increased in drylands from monocropping to intercropping to double cropping.

59. The recent researches made by the ICAR, especially after the advent of the hyvs and hybrids of crops during the mid sixties, have shown that it is possible to evolve crop production technologies for increasing productivity in dry lands by 200 to 400 per cent. Mere proper management of cultivation and crop, perse, enhances yields only by 15 per cent. It is the use of improved seeds which adds 40 per cent and the use of moderate levels of fertilisers which improves yields by 50 per cent. The ratio between grass root extension workers and farmers should be reduced to 1:400 for providing more spot guidance to the farmers to take timely and effective measures for enhancing productivity. The future of foodgrains in India lies to a considerable extent with improved dryland farming.
60. It is the environment, which includes soil, rainfall and temperature, that determines the crops and cropping systems. Based on long term rainfall analysis, it has become possible to identify the cropping season in different agro-climatic regions. As the season increases beyond 20 weeks, intercropping can be effectively adopted and when the growing season is beyond 30 weeks, double cropping can be taken up.

"The minimum requirements for different crops in terms of soil, rainfall and temperature, for efficient and fuller exploitation of moisture are being identified...

"At this juncture it is important to point out that so far crop production in rainfed land has been essentially through monocropping. Even fallowing is practised. In such situations increasing crop intensity without improving fertility might be disastrous. In other words, with increased crop intensity, the cumulative native fertility would be almost of no significance and hence external application of the more limiting nutrients would be essential to sustain higher production".²

NOTES

1. J. Venkateswarlu "Dryland Farming" Central Institute for Dryland Agriculture, Hyderabad, India, 1985, P. 15.
2. J. Venkateswarlu in "Efficient Management of Dryland Crops" 1985 Central Research Institute for Dry Land Agriculture, Hyderabad, India. pp. 15-16,

Epilogue

As said earlier, this book is intended to provoke the politician as well as the bureaucrat of UP and Bihar into thinking why the message of the Green Revolution has not reached the cultivating masses of these two states, to produce a favourable reaction of the type it did in the case of Punjab, Haryana and even Western UP. To make things clearer, the genesis of that Revolution, and its essential components, were described in detail (in Part Two of the book). It was shown that the Revolution in full vigour would be caused only by a "Package" of policy decisions relating to the components provided these were properly implemented, in the broad sequence indicated. That description was preceded by an analysis of the agricultural (food-grains) situation in India, present and prospective, in the context of the country's demographic and economic compulsions; it was followed by (in Part III) the reactions of the states of Punjab, Haryana, UP and Bihar towards the call of the Green Revolution, showing how its effect was so varied, even contradictory interse, in its content that the impact on the ground appeared to be indicative of even a generation gap, as for example between Punjab and Bihar. It was inevitable that some analysis of these disparities between the states concerned in regard to that impact should be made, to the extent it was possible at the macro as well as the micro levels. Part IV of the book is the result of the author's effort and thinking in the matter.

Total picture, as it emerges from a study of events and acts of omission and commission of the respective four state administrations in this behalf in the last twenty years, shows that whereas Punjab and Haryana took time by the forelock and availed of the revolutionary message, in time as well as space, and in result did very well for themselves and the country, the states of UP (except for its western parts) and Bihar were not that fortunate and lost the chance by at least one generation, even though ostensibly they tried their best and even went through many motions relevant to the needs of that revolution. They made some progress in agricultural production

and per ha yields of wheat and rice from the Fourth Plan onwards but the increase in population neutralised that progress and, in per capita terms, the effect was negative. As has been mentioned in an earlier chapter, the Green Revolution ideology was itself intended to neutralise the adverse effect of the demographic explosion in the Third World countries, by making a big contribution to the bread-basket in the shape of increased production of foodgrains—enough to cover the excess population and to spare for raising the nutritional standards.

That meant that the efforts made by the states of UP and Bihar were grossly inadequate in deriving the optimum benefit from the Green Revolution spread in the country from the mid sixties onwards. Why? Part IV of the Book has given some possible answers though not all. The very size of these states—unwieldy, unmanageable and over-populous—was inhibiting the success on the ground of any developmental plans, including those of agricultural production under the new technology, for the simple reason that the monitoring attention of any well meaning political or bureaucratic head of the show was not adequately available to supervise the operation at the grassroots nor was that attention of sufficient intensity and frequency to effectively deal with the delinquent officials on the spot, where necessary. When new plans are introduced—like those connected with the Green Revolution—a lot of spade work has to be done and the actual implementation has to be thoroughly supervised, with a view to producing tangible results. For such planning the states of UP and Bihar happen to be too huge to be adequately managed, administered or developed by a single chief minister or development commissioner in their respective spheres. It bears repetition to mention here again the pertinent remark of the late Mrs Sucheta Kriplani, ex chief minister of UP, that when she addressed a conference of her (56 or 57) collectors, she felt she was addressing a public meeting. It was a polite way of conveying her helplessness in influencing directly the operative machinery in the field. New projects, to be successful, need personalised attention at the top, if they involve changing people's habits or traditional ways of doing things. Green Revolution ideology to take root in a traditional soil would require that sort of attention at many levels.

Our study showed that in Punjab and Haryana the credit for the success of the Green Revolution went to late Partap Singh Kairon in the case of Punjab and to Ch Bansi Lal in the case of Haryana. The former had prepared the ground for it unwittingly as he was broadly keen to do everything possible to improve Punjab's agriculture and economy, and he did it so well that when the Green Revolution concept swept the field in the mid-sixties, everyone in the Punjab was prepared to receive it with open arms and so willingly. The latter showed his keenness and asserted his mettle to catch up with the neighbouring state, if not to beat it in the game of agricultural production. He also did his job remarkably well. Both the leaders made full use of the local resources, exploited all political and others opportunities to make a success of their efforts to reach the goal; their objectives were so clearcut and the means to attain them so thorough that they received maximum cooperation not only from the bureaucracy but also from the masses. Do such 'go-getter' leaders arise only in small states? Not necessarily but the operational opportunities are, perhaps, more easily available in a smaller state where a strong-

willed and determined leader can function more effectively in his own way from A to Z and make a thumping good success of the objectives he strives for.

Bureaucracy is an instrument in the hands of the political bosses in a free democratic country such as ours. These bosses can make use of the instrument as best as they can. If the bureaucracy suffers from inertia and other weaknesses, it can be shaken out of them overtime by a determined leadership and trained motivated in the correct direction. If the political leadership is above board, strong and determined and is capable of asserting its political will, the bureaucracy has no other option but to fall in, in the normal course. We have dealt with the weaknesses and strong points of our bureaucracy, including its capabilities, in a developmental role, in Chapter II. There is nothing basically wrong with it except that it must be trained and motivated properly and on the right lines for that role. If there is an above-board "understanding" between the political leadership and the bureaucracy, the results in the field will be automatic since, ipso facto, planning will be done thoroughly and the implementation of the plans carried out meticulously. The mass of our people in the raw are ever keen to do the right things and follow all useful advice, provided their economic interest is served thereby and they get a real chance to be pulled out of their penury and helplessness. A particular class of the lowest rung (economically) of the people in both the states, called the small and marginal farmers and agricultural labourers, would need particular attention of the state government concerned; any help to them, as a target group, will help the cause of the green revolution/agricultural production. We have dealt with them in Chapter 14.

Chapter 15 deals with some illustrative subjects to help the planning for Green Revolution. These subjects are not exhaustive at all. There is plenty of further detail and prescription required, according to local conditions and variations, before any operational projects can be drawn up for execution by the field staff. Consolidation of fragmented holding is an instance in point. There will be many aspects of the problem, depending on the state of the revenue records and the adequacy or reliability of the revenue administration. Will separate staff be required for consolidation work, suitably trained for the job? Could help and guidance be sought from states like Punjab and Haryana where this work was efficiently done in the fifties and sixties? And so on.

What is the extent of the present administrative involvement in intensive agriculture in the field? Is the system working smoothly, with discipline and efficiency or are investments in irrigation and tubwells etc. going down the drain? What is the overall health of the bureaucracy, consisting of generalists, scientists and technocrats at various levels? Are they working in unison or at crosspurposes? We have dealt with this in Chapter 12. Chapter 13 has gone some way with the various aspects of implementation of projects on the ground, including the problems arising from dilatory, time consuming and complicated working procedures. All these numerous aspects and problems impinging on the goal we had set ourselves in the beginning—that of getting the Green Revolution on the ground, in UP and Bihar, in the manner of Punjab and Haryana—will have to be gone into, dissolved or resolved and a working plan drawn up in a comprehensive manner, its resource and

financial implications worked out, including the physical aspect of numerous input supplies and services. And so on. And then the manpower planning will need attention, to put the projects on the ground—the cadres carefully selected, trained and motivated. The further we go into the matter, the more complicated it will appear to become. This is natural but an eplilogue is certainly not the place for doing it.

Coming down to brass tacks, as it were, a major feature of the Green Revolution strategy is the “package” of hyv seeds, fertilisers, pesticides, controlled water supply, some mechanical equipment like seed drills and threshers—even tractors etc. The real core is the ‘miracle’ seed, developed through selective breeding to be highly responsive to chemical fertilisers. To get the best out of these miracle seeds, infrastructural (some long-range) facilities like land consolidation, irrigation/controlled water supply rural electrification, rural roads, regulated markets—will have to be organised. While action on some long-range infrastructural activities gets going, a plan of action for implementation straight away will have to be prepared with whatever resources and facilities may be available, provided it fits in with the overall scheme of things. Not that any one person—political or administrative—is indispensable but it will be in the fitness of an overall strategy, if the Development Commissioner is carefully chosen and retained in his job long enough to show tangible results on the ground.

Not only the basic knowledge will have to be imparted to the farmers regarding the sowing and care of the new seeds, use of proper doses of fertilisers and pesticides, watering routine, cropping rotation, essentials of double cropping etc, a major feature of the strategy would be the emphasis on organisational and institutional arrangements for the production and distribution of the package of inputs of good quality and in time. The new strategy is selective in approach as between areas and farmers. People with risk-taking capacity for investment, resourcefulness and innovativeness indispensable but it will be would get preference in the normal course. So the course. So the poor small and marginal farmers down the line would need special attention, even arrangements.

In the end it may be mentioned briefly that even though we start the Green Revolution with ‘miracle’ seeds, it is not automatic that miracles may happen and productivity as well as production may increase in the field. It is indeed a very long haul between sowing of the miracle seed and the harvesting of a bumper crop. Determination, good planning efficient implementation and hard work down the line—all these things are needed in good measure. There is nothing like trying hard for any goal.

Last but not least, dear reader, let us look at the “Quotes” in the beginning of the book once again.

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